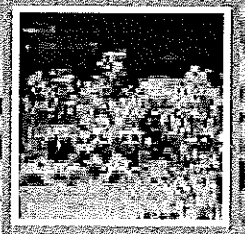
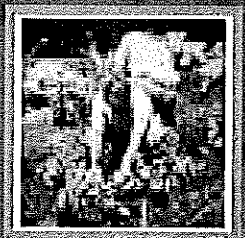


RAIN GARDENS

A how-to manual
for homeowners





RAIN GARDENS

Your personal contribution to cleaner water

Homeowners in many part of the country are catching on to rain gardens – landscaped areas planted to wild flowers and other native vegetation that soak up rain water, mainly from the roof of a house or other building. The rain garden fills with a few inches of water after a storm and the water slowly filters into the ground rather than running off to a storm drain. Compared to a conventional patch of lawn, a rain garden allows about 30% more water to soak into the ground.

Why are rain gardens important? As cities and suburbs grow and replace forests and agricultural land, increased stormwater runoff from impervious surfaces becomes a problem. Stormwater runoff from developed areas increases flooding; carries pollutants from streets, parking lots and even lawns into local streams and lakes; and leads to costly municipal improvements in stormwater treatment structures.

By reducing stormwater runoff, rain gardens can be a valuable part of changing these trends. While an individual rain garden may seem like a small thing, collectively they produce substantial neighborhood and community environmental benefits. Rain gardens work for us in several ways:

- ✦ Increasing the amount of water that filters into the ground, which recharges local and regional aquifers;
- ✦ Helping protect communities from flooding and drainage problems;
- ✦ Helping protect streams and lakes from pollutants carried by urban stormwater – lawn fertilizers and pesticides, oil and other fluids that leak from cars, and numerous harmful substances that wash off roofs and paved areas;
- ✦ Enhancing the beauty of yards and neighborhoods;
- ✦ Providing valuable habitat for birds, butterflies and many beneficial insects.



Who should use this manual?

This manual provides homeowners and landscape professionals with the information needed to design and build rain gardens on residential lots. Guidelines presented in this manual can also be used to treat roof runoff at commercial and institutional sites. However, the manual should not be used to design rain gardens for parking lots, busy streets and other heavily used paved areas where stormwater would require pretreatment before entering a rain garden.

Frequently asked questions

Does a rain garden form a pond?

No. The rain water will soak in so the rain garden is dry between rainfalls. (Note: some rain gardens can be designed to include a permanent pond, but that type of rain garden is not addressed in this publication).

Are they a breeding ground for mosquitoes?

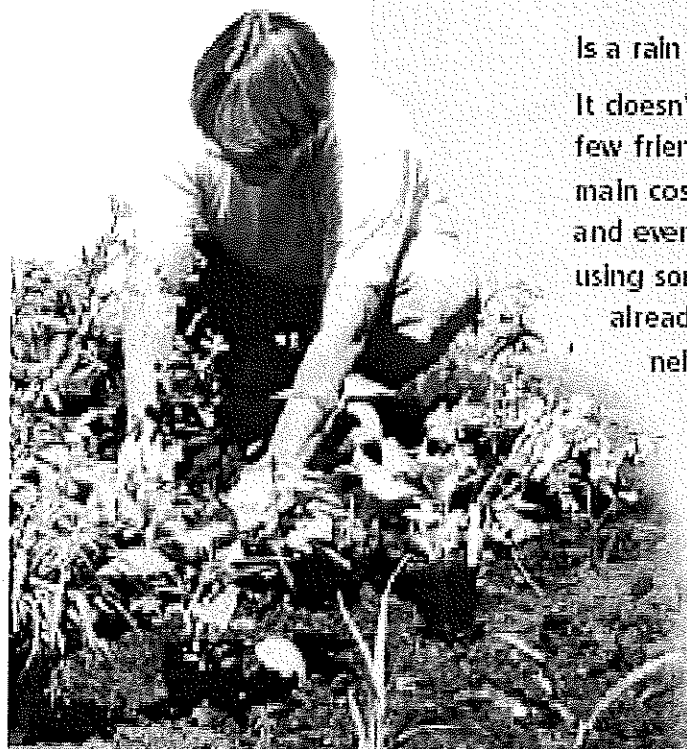
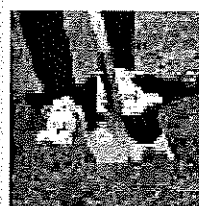
No. Mosquitoes need 7 to 12 days to lay and hatch eggs, and standing water in the rain garden will last for a few hours after most storms. Mosquitoes are more likely to lay eggs in bird baths, storm sewers, and lawns than in a sunny rain garden. Also rain gardens attract dragonflies, which eat mosquitoes!

Do they require a lot of maintenance?

Rain gardens can be maintained with little effort after the plants are established. Some weeding and watering will be needed in the first two years, and perhaps some thinning in later years as the plants mature.

Is a rain garden expensive?

It doesn't have to be. A family and a few friends can provide the labor. The main cost will be purchasing the plants, and even this cost can be minimized by using some native plants that might already exist in the yard or in a neighbor's yard.





Sizing and Siting the Rain Garden

This section of the manual covers rain garden basics – where to put the rain garden, how big to make it, how deep to dig it, and what kind of soils and slope are best. Following the instructions in this section is the best way to ensure a successful rain garden project.

If you already know the size you want your rain garden to be, then skip ahead to the section about building the rain garden. However, take time read the pointers about location, and do find the slope of the lawn. If the location has a slope more than about 12% it's best to pick a different location because of the effort it will take to create a level rain garden.



An extension of PVC pipe helps direct downspout water to this rain garden.

Where should the rain garden go?

Home rain gardens can be in one of two places – near the house to catch only roof runoff or farther out on the lawn to collect water from the lawn and roof. (Figure 1 shows the possible locations on a residential lot.)

To help decide where to put a rain garden, consider these points:

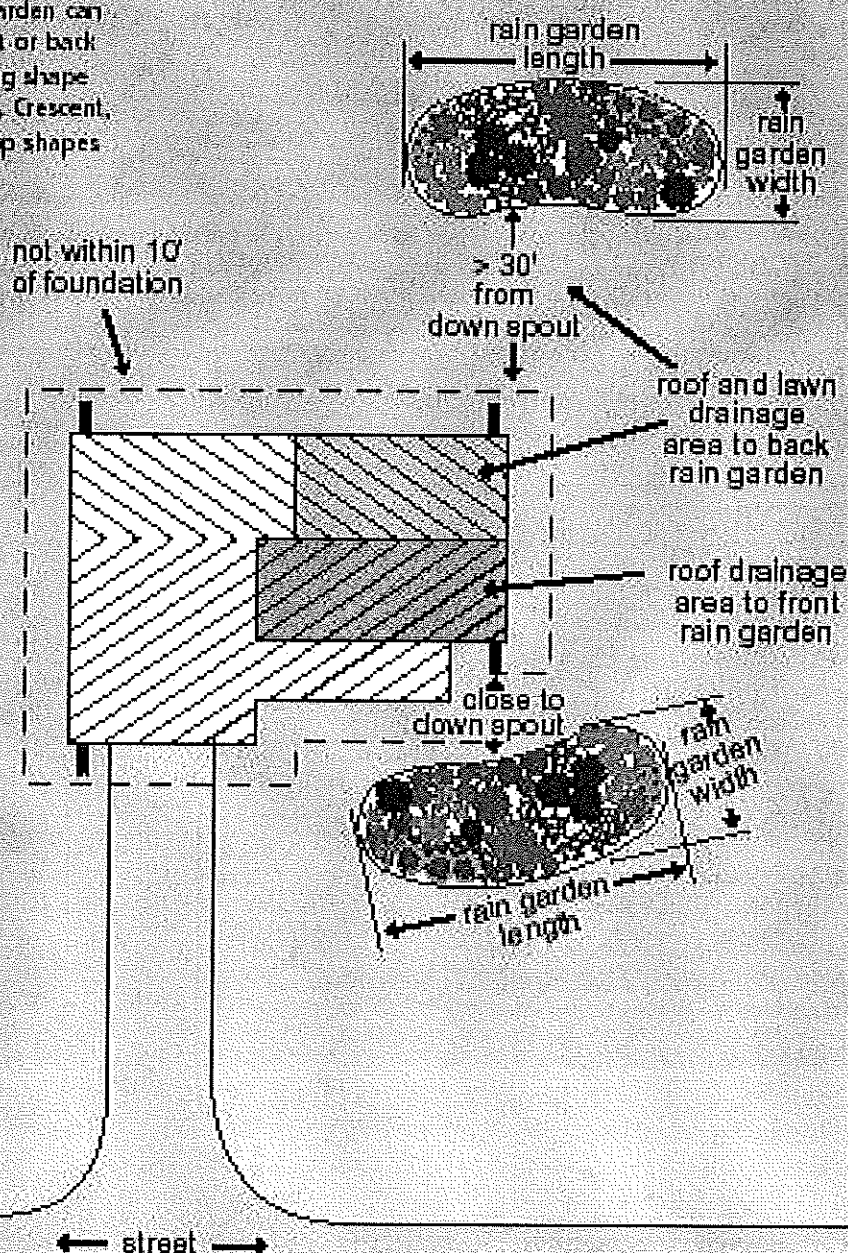
- The rain garden should be at least 10 feet from the house so infiltrating water doesn't seep into the foundation.
- Do not place the rain garden directly over a septic system.
- It may be tempting to put the rain garden in a part of the yard where water already ponds. Don't! The goal of a rain garden is to encourage infiltration, and your yard's wet patches show where infiltration is slow.
- It is better to build the rain garden in full or partial sun, not directly under a big tree.
- Putting the rain garden in a flatter part of the yard will make digging much easier. For example, a rain garden 10 feet wide on a 10% slope must be 12 inches deep to be level, unless you import topsoil or use cut and fill.

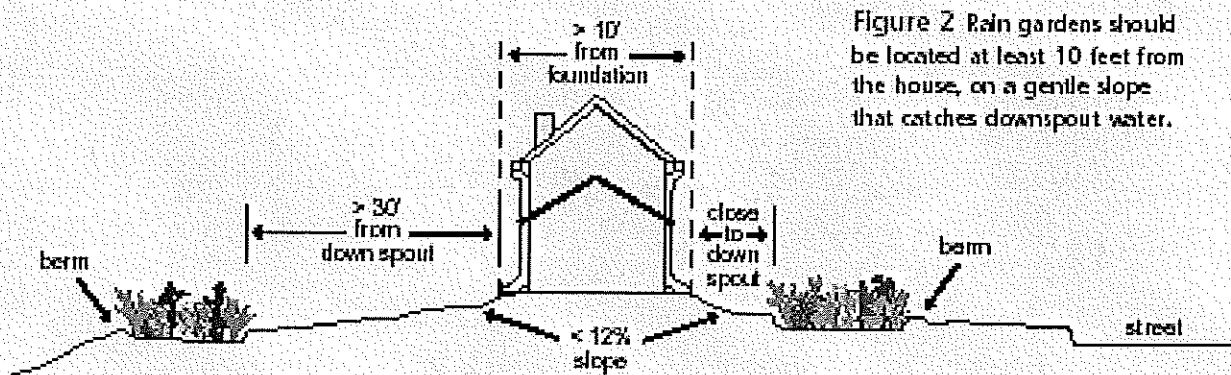
Consider your overall landscape

When considering placement of your rain garden, design with the end in mind. Carefully consider how the rain garden can be integrated into existing and future landscaping. Also, pay attention to views from inside the house as well as those

throughout the landscape. Determine how far or how close you want your rain garden to outdoor gatherings spaces or other play areas. Why not locate it near a patio where you can take advantage of the colors and fragrances for hours on end!

Figure 1 A rain garden can be built in the front or back yard. Pick a pleasing shape for the rain garden. Crescent, kidney, and teardrop shapes seem to work well.





How big should the rain garden be?

The surface area of the rain garden can be almost any size, but time and cost will always be important considerations in sizing decisions. Any reasonably sized rain garden will provide some stormwater runoff control.

A typical residential rain garden ranges from 100 to 300 square feet. Rain gardens can be smaller than 100 square feet, but very small gardens have little plant variety. If a rain garden is larger than 300 square feet it takes a lot more time to dig, is more difficult to make level, and could be hard on your budget.

The size of the rain garden will depend on

- how deep the garden will be,
- what type of soils the garden will be planted in, and
- how much roof and/or lawn will drain to the garden.

This information, along with the sizing factor from the tables on page 9, will determine the surface area of the rain garden.

Guidelines are not rules...

The sizing guidelines described in this manual are based on a goal of controlling 100% of the runoff for the average rainfall year while keeping the size of the rain garden reasonable. Establishing a 100% runoff goal helps compensate for some of the errors that creep into the design and construction of any rain garden.

If you follow the guidelines in the manual and decide the calculated surface area is just too large for your goals, it is perfectly acceptable to make the rain garden smaller. The rain garden can be up to 30% smaller and still control almost 90% of the annual runoff. On the other hand, it is fine to make the rain garden bigger than the guidelines indicate.

digging with a rented backhoe



How Deep Should the Rain Garden Be?

A typical rain garden is between four and eight inches deep. A rain garden more than eight inches deep might pond water too long, look like a hole in the ground, and present a tripping hazard for somebody stepping into it. A rain garden much less than four inches deep will need an excessive amount of surface area to provide enough water storage to infiltrate the larger storms.

No matter what the depth of the rain garden, the goal is to keep the garden level. Digging a very shallow rain garden on a steep lawn will require bringing in extra topsoil to bring the downslope part of the garden up to the same height as the up-slope part of the garden. As the slope gets steeper, it is easier to dig the rain garden a little deeper to make it level.

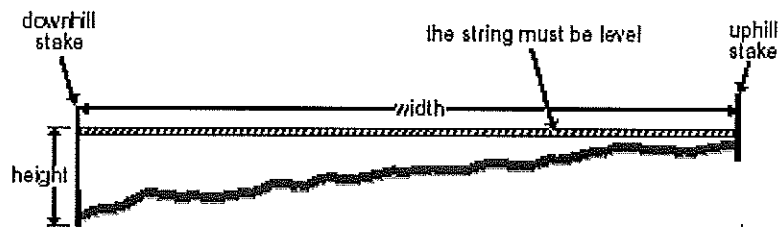


Figure 3 The string should be tied to the base of the uphill stake, then tied to the downhill stake at the same level.

The slope of the lawn should determine the depth of the rain garden. Find the slope of your lawn by following these steps. (Figure 3 shows how the stakes and string should look.)

1. Pound one stake in at the uphill end of your rain garden site and pound the other stake in at the downhill end. The stakes should be about 15 feet apart.
2. Tie a string to the bottom of the uphill stake and run the string to the downhill stake.
3. Using a string level or the carpenter's level, make the string horizontal and tie the string to the downhill stake at that height.
4. Measure the width (in inches) between the two stakes.
5. Now measure the height (in inches) on the downhill stake between the ground and string.
6. Divide the height by the width and multiply the result by 100 to find the lawn's percent slope. If the slope is more than 12%, it's best to find another site or talk to a professional landscaper.

Using the slope of the lawn, select the depth of the rain garden from the following options:

- If the slope is less than 4%, it is easiest to build a 3 to 5-inch deep rain garden.
- If the slope is between 5 and 7%, it is easiest to build one 6 to 7 inches deep.
- If the slope is between 8 and 12%, it is easiest to build one about 8 inches deep.

EXAMPLE

Todd measures the length of the string between the stakes; it is 180 inches long. The height is 9 inches. He divides the height by the width to find his lawn's percent slope.

$$\frac{\text{height}}{\text{width}} \times 100 = \% \text{ slope} \quad \frac{9 \text{ inches}}{180 \text{ inches}} \times 100 = 5\% \text{ slope}$$

With a 5% slope, Todd should build a 6 inch deep rain garden.

What type of soils are on the rain garden site?

After choosing a rain garden depth, identify the lawn's soil type as sandy, silty, or clayey. Sandy soils have the fastest infiltration; clayey soils have the slowest. Since clayey soils take longer to absorb water, rain gardens in clayey soil must be bigger than rain gardens in sandy or silty soil. If the soil feels very gritty and coarse, you probably have sandy soil. If your soil is smooth but not sticky, you have silty soil. If it is very sticky and clumpy, you probably have clayey soil.

How big is the area draining to the rain garden?

The next step in choosing your rain garden size is to find the area that will drain to the rain garden. As the size of the drainage area increases so should the size of the rain garden. There is some guesswork in determining the size of a drainage area, especially if a large part of the lawn is up-slope from the proposed garden site. Use the suggestions below to estimate the drainage area without spending a lot of time.

Rain gardens less than 30 feet from the downspout

If the rain garden is far from the house, and you don't want a swale or downspout cutting across the lawn, run a PVC pipe underground from the downspout to the rain garden. In this case do calculations as for a rain garden less than 30 feet from the house.

1. In this case, where the rain garden is close to the house, almost all water will come from the roof downspout. Walk around the house and estimate what percent of the roof feeds to that downspout. Many houses have four downspouts, each taking about 25% of the roof's runoff.
2. Next find your home's footprint, the area of the first floor. If you don't already know it, use a tape measure to find your house's length and width. Multiply the two together to find the approximate area of your roof.
3. Finally, multiply the roof area by the percent of the roof that feeds to the rain garden downspout. This is the roof drainage area.

Rain gardens more than 30 feet from the downspout

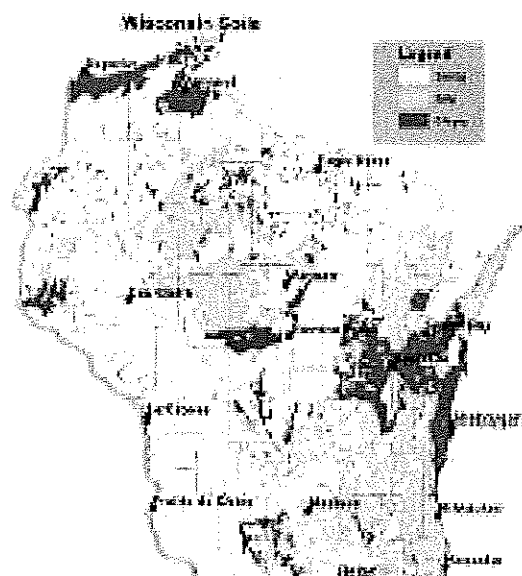
1. If there is a significant area of lawn uphill that will also drain to the rain garden, add this lawn area to the roof drainage area. First find the roof drainage area using the steps above for a rain garden less than 30' from the downspout.
2. Next find the area of the lawn that will drain to the rain garden. Stand where your rain garden will be and look up toward the house. Identify the part of the lawn sloping into the rain garden.
3. Measure the length and width of the uphill lawn, and multiply them to find the lawn area.
4. Add the lawn area to the roof drainage area to find the total drainage area.

✓ **EXAMPLE**

Todd's house is 60 feet by 40 feet, so the roof area is 2400 square feet. He estimates that the downspout collects water from 25% of the roof, so he multiplies 2400 by 0.25 to get a downspout drainage area of 600 square feet.

Roof Area: $60 \text{ ft} \times 40 \text{ ft} = 2400 \text{ square ft.}$

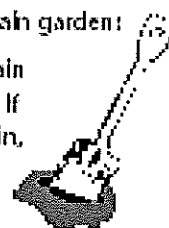
Drainage Area: $2400 \text{ square ft.} \times 0.25 = 600 \text{ square ft.}$



Simple soil tests

Two small tests can ensure your soil can handle a rain garden:

- Dig a hole about 6 inches deep where the rain garden is to go and fill the hole with water. If the water takes more than 24 hours to soak in, the soil is not suitable for a rain garden.
- Take a handful of soil and dampen it with a few drops of water. After kneading the soil in your fingers, squeeze the soil into a ball. If it remains in a ball, then work the soil between your forefinger and thumb, squeezing it upward into a ribbon of uniform thickness. Allow the ribbon to emerge and extend over the forefinger until it breaks from its own weight. If the soil forms a ribbon more than an inch long before it breaks, and it also feels more smooth than gritty, the soil is not suitable for a rain garden.



The map is a starting point for assessing what type of soils you might find in your yard. However, the soil on a small plot of a yard can be very different from the soils indicated on the map. Use the simple soil test described here for a more accurate representation of the soils in the possible rain garden location. More information about sampling and testing lawn and garden soils can be obtained at county UW-Extension offices.

Using the Rain Garden Size Factors

Having estimated the drainage area, soil type, and depth for your rain garden, use Table 1 or Table 2 to determine the rain garden's surface area. Use Table 1 if the rain garden is less than 30 feet from the downspout, and use Table 2 if it is more than 30 feet from the downspout.

Table 1 Rain gardens less than 30 feet from downspout.

	3-5 in. deep	6-7 in. deep	8 in. deep
Sandy soil	0.19	0.15	0.08
Silty soil	0.34	0.25	0.16
Clayey soil	0.43	0.32	0.20

Table 2 Rain gardens more than 30 feet from downspout.

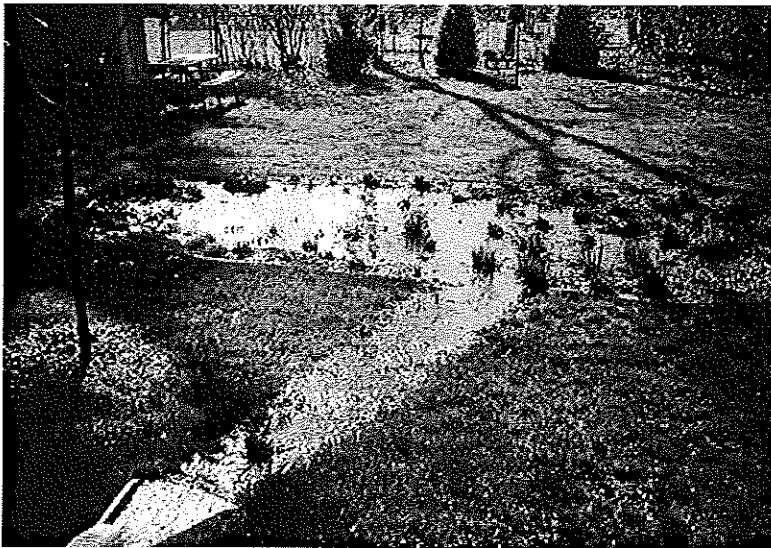
	Size Factor, for all depths
Sandy soil	0.03
Silty soil	0.06
Clayey soil	0.10

1. Find the size factor for the soil type and rain garden depth.
2. Multiply the size factor by the drainage area. This number is the recommended rain garden area.
3. If the recommended rain garden area is much more than 300 square feet, divide it into smaller rain gardens.

EXAMPLE

Todd's rain garden is less than 30 feet from the downspout, and his lawn has a 5% slope, so he will have a 6-inch deep rain garden. His lawn is silty, so Table 1 recommends a size factor of 0.25. He multiplies the downspout drainage area, 600 square feet, by 0.25 to find the recommended rain garden area, 150 square feet.

$$600 \text{ square ft. by } 0.25 = 150 \text{ square ft.}$$



Runoff flows into a new rain garden (shown before plants are fully grown).

How long and how wide should the rain garden be?

Before building the rain garden, think about how it will catch water. Runoff will flow out of a downspout and should spread evenly across the entire length of the rain garden. The rain garden must be as level as possible so water doesn't pool at one end and spill over before it has a chance to infiltrate.

The longer side of the rain garden should face upslope; that is, the length of the rain garden should be perpendicular to the slope and the downspout. This way the garden catches as much water as possible. However, the rain garden should still be wide enough for the water to spread evenly over the whole bottom and to provide the space to plant a variety of plants. A good rule of thumb is that the rain garden should be about twice as long (perpendicular to the slope) as it is wide.

When choosing the width of the garden, think about the slope of the lawn. Wide rain gardens and rain gardens on steep slopes will need to be dug very deep at one end in order to be level. If the rain garden is too wide, it may be necessary to bring in additional soil to fill up the downhill half. Experience shows that making a rain garden about 10 feet wide is a good compromise between the effect of slope and how deep the rain garden should be. A rain garden should have a maximum width of about 15 feet, especially for lawns with more than about an 8 percent slope.

To determine the length of the rain garden:

1. Pick the best rain garden width for your lawn and landscaping.
2. Divide the size of your rain garden by the width to find your rain garden's length.

✓ EXAMPLE

Todd wants a 10-foot wide rain garden, so he divides 150 by 10 to find the rain garden length, 15 feet.

$$\frac{\text{rain garden area}}{\text{width}} = \text{length} \quad \frac{150 \text{ ft}}{10 \text{ ft}} = 15 \text{ ft}$$

Choose a size that is best for your yard

Remember that these are only guidelines. The size of the rain garden also depends on how much money you want to spend, how much room you have in your yard, and how much runoff you want to control.

Again, you can reduce the size of your rain garden by as much as 30% and still control almost 90% of the runoff. If the sizing table suggests that the rain garden be 200 square feet, but there is only enough room for a 140 square feet rain garden, that's fine. A smaller rain garden will usually work to control most stormwater runoff, although some bigger storms might over-top the berm.



Step 2

Building the Rain Garden

Now that the size and place for the rain garden are set, it's time to get a shovel and start digging. Working alone, it will take about six hours to dig an average-size rain garden. If friends help it will go much faster, possibly only an hour or two.

Before you start digging, call
Digger's Hotline at 1-800-242-8511.

► If you are building the rain garden into an existing lawn, digging time can be reduced by killing the grass first. A chemical such as Round-Up can be used, but a more environmentally friendly approach is to place black plastic over the lawn until the grass dies. Also, the best time to build the rain garden is in the spring. It will be easier to dig, and the plants are more likely to thrive.



A note on tools

The following tools will help in building the rain garden. Some of the tools are optional.

• Tape measure

• Shovels

• Rakes

• Trowels

• Carpenter's level

• Wood stakes, at least 2 ft long

• String

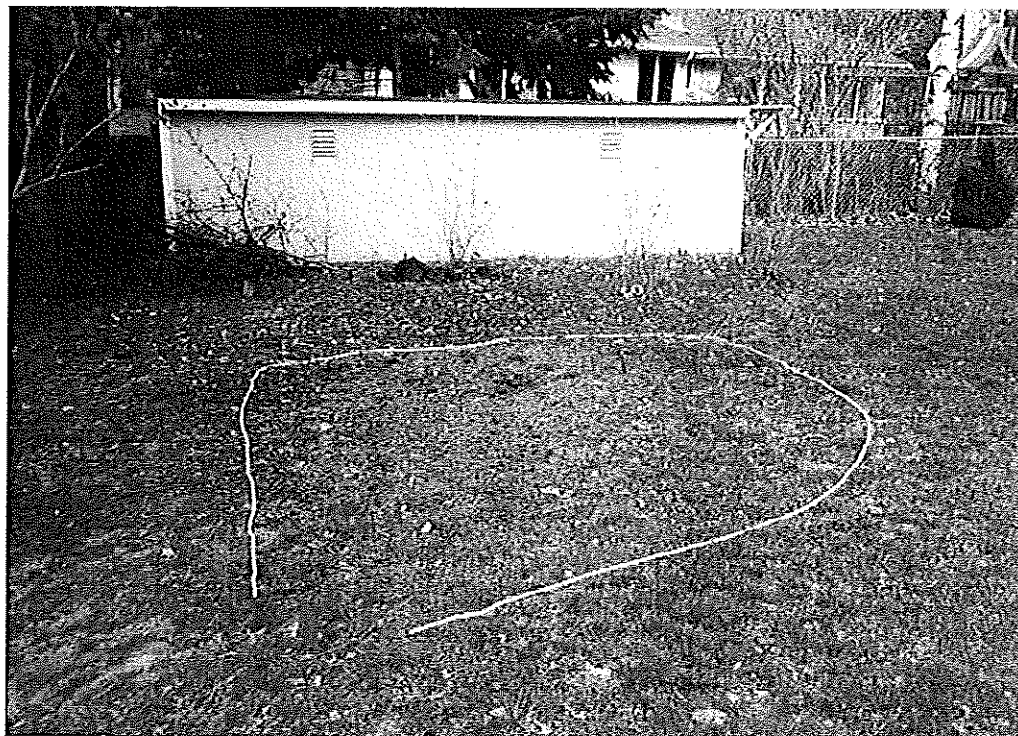
• 2x4 board, at least 6 ft long (optional)

• Small backhoe with caterpillar treads (optional)

Leveling the rain garden

One way to check the level of the rain garden is to just "eyeball" it. To do it more accurately follow these steps:

- When the whole area has been dug out to about the right depth, lay the 2x4 board in the rain garden with the carpenter's level sitting on it. Find the spots that aren't flat. Fill in the low places and dig out the high places.
- Move the board to different places and different directions, filling and digging as necessary to make the surface level.
- When the rain garden is as level as you can get it, rake the soil smooth.



The perimeter of a rain garden is defined with string before digging.

Digging the rain garden

While digging the rain garden to the correct depth, heap the soil around the edge where the berm will be. (The berm is a low "wall" around three sides of the rain garden that holds the water in during a storm.) On a steeper lawn the lower part of the rain garden can be filled in with soil from the uphill half, and extra soil might need to be brought in for the berm.

Start by laying string around the perimeter of your rain garden. Remember that the berm will go outside the string. Next, put stakes along the uphill and downhill sides, lining them up so that each uphill stake has a stake directly downhill. Place one stake every 5 feet along the length of the rain garden.

Start at one end of the rain garden and tie a string to the uphill stake at ground level. Tie it to the stake directly downhill so that the string is level. Work in 5-foot wide sections, with only one string at a time. Otherwise the strings will become an obstacle.

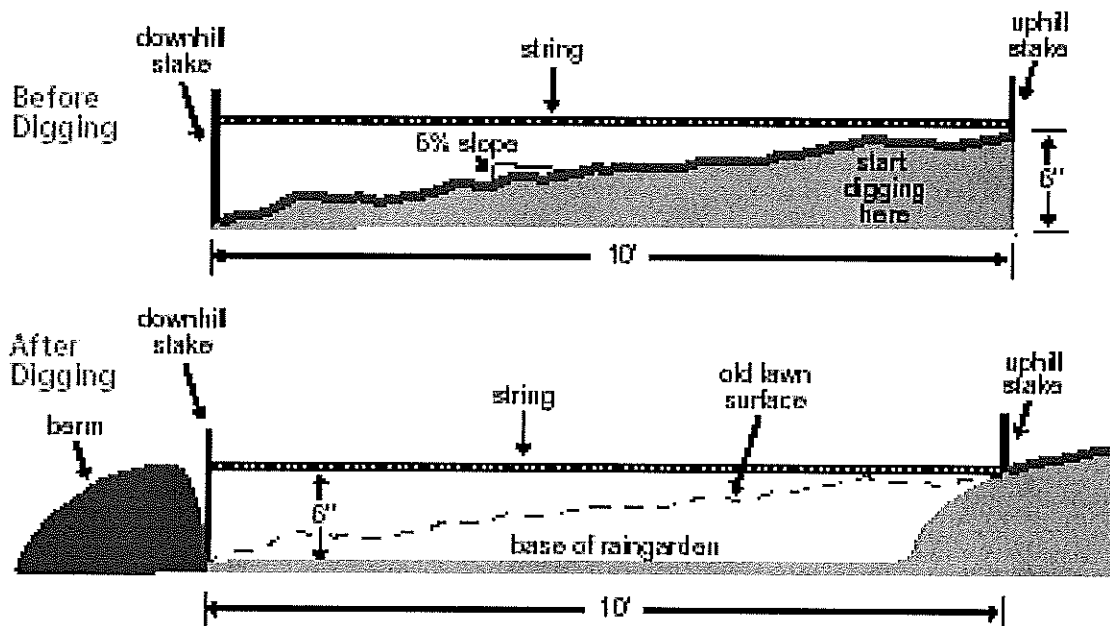
Start digging at the uphill side of the string. Measure down from the string and dig until you reach the depth you want the rain garden to be. If the rain garden will be four inches deep, then dig four inches down from the string. Figure 4 shows how.

If the lawn is almost flat, you will be digging at the same depth throughout the rain garden and using the soil for the berm. If the lawn is steeper, the high end of the rain garden will need to be dug out noticeably more than the low end, and some of the soil from the upper end can be used in lower end to make the rain garden level. Continue digging and filling one section at a time across the length of your rain garden until it is as level as possible.

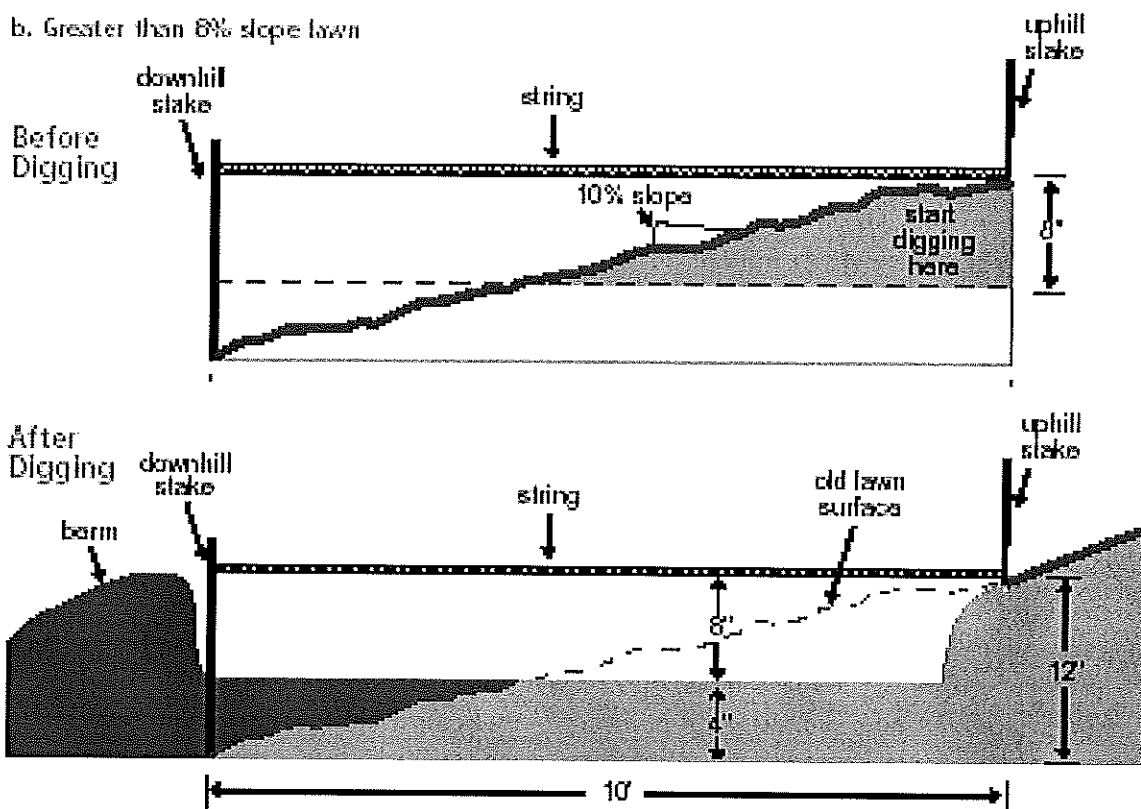
In any garden compost will help the plants become established and now is the time to mix in compost if needed. Using a roto-tiller can make mixing much easier, but isn't necessary. If you do add compost, dig the rain garden a bit deeper. To add two inches of compost, dig the rain garden one to two inches deeper than planned.

Figure 4 Where to dig and where to put the soil you've dug.

a. Between 3% and 6% slope lawn



b. Greater than 6% slope lawn



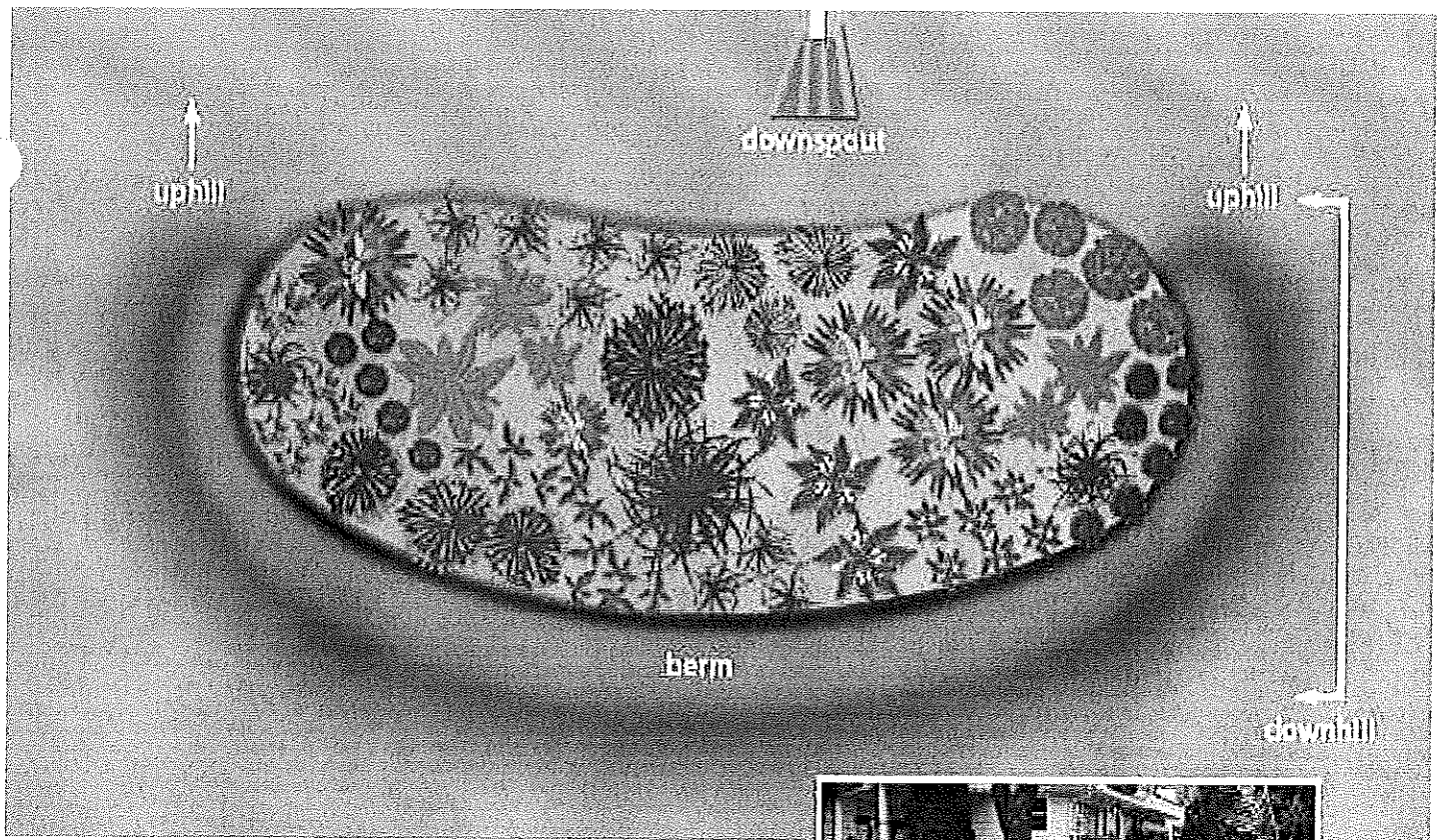


Figure 5 The top of the downhill part of the berm should come up to the same elevation as the entry to the rain garden at the uphill end.

Making the Berm

Water flowing into the rain garden will naturally try to run off the downhill edge. A berm is needed to keep the water in the garden. The berm is a "wall" across the



On a gentle slope, soil from digging out the garden can be used to create the berm. This rain garden is 4 inches deep.

bottom and up the sides of the rain garden. The berm will need to be highest at the downhill side. Up the sides of the rain garden, the berm will become lower and gradually taper off by the time it reaches the top of the rain garden. Figure 5 shows how the berm should look.

On a flat slope there should be plenty of soil from digging out the rain garden to use for a berm. On a steeper slope, most of the soil from the uphill part of the rain garden was probably used to fill in the downhill half, and soil will have to be brought in from somewhere else. After shaping the berm into a smooth ridge about a foot across, stomp on it. It is very important to have a well-compacted berm, so stomp hard. The berm should have very gently sloping sides; this helps smoothly integrate the rain garden with the surrounding lawn and also makes the berm less susceptible to erosion.

To prevent erosion, cover the berm with mulch or plant grass. Use straw or erosion control mat to protect the berm from erosion while the grass is taking root.

If you don't want to plant grass or mulch over the outside of the berm, you can also plant dry-tolerant prairie species. Some potential berm species are prairie dropseed, little bluestem, prairie smoke, blue-eyed grass, prairie phlox, and shooting star.

Note: If the downspout is a few feet from the entry to the rain garden, make sure the water runs into the garden by either digging a shallow grass swale or attaching an extension to the downspout.

Tips for designing an attractive rain garden

While rain gardens are a highly functional way to help protect water quality, they are also gardens and should be an attractive part of your yard and neighborhood. Think of the rain garden in the context of your home's overall landscape design. Here are a few tips:

When choosing native plants for the garden, it is important to consider the height of each plant, bloom time and color, and its overall texture. Use plants that bloom at different times to create a long flowering season. Mix heights, shapes, and textures to give the garden depth and dimension. This will keep the rain garden looking interesting even when few wildflowers are in bloom.

When laying plants out, randomly clump individual species in groups of 3 to 7 plants to provide a bolder statement of color. Make sure to repeat these individual groupings to create repetition and cohesion in a planting. This will provide a more traditional formal look to the planting.

Try incorporating a diverse mixture of sedges, rushes, and grasses with your flowering species (forbs). This creates necessary root competition that will allow plants to follow their normal growth patterns and not outgrow or out-compete other species. In natural areas, a diversity of plant types not only adds beauty but also create a thick underground root matrix that keeps the entire plant community in balance. In fact, 80% of the plant mass in native prairie communities is underground. Once the rain garden has matured and your sedges, rushes and grasses have established a deep, thick root system, there will be less change in species location from year to year, and weeds will naturally decline.

Finally, consider enhancing the rain garden by using local or existing stone, ornamental fences, trails, garden benches, or additional wildflower plantings. This will help give the new garden an intentional and cohesive look and provide a feeling of neatness that the neighbors will appreciate.





Step 3

Planting and Maintaining the Rain Garden

Planting the rain garden is the fun part! A number of planting designs and lists of suggested plants are included at the end of this publication. Use these for ideas, but don't be afraid to be creative – there's no single best way to plant a rain garden. Anyone who has ever done any gardening will have no problem planting a rain garden, but a few basic reminders are listed below.

Planting the rain garden

Select plants that have a well established root system. Usually one or two-year-old plants will have root systems that are beginning to circle or get matted. (Note: use only nursery-propagated plants; do not collect plants from the wild).

Make sure to have at least a rough plan for which plants will be planted where. Lay out the plants as planned one foot apart in a grid pattern, keeping them in containers if possible until they are actually planted to prevent drying out before they get in the ground.

Dig each hole twice as wide as the plant plug and deep enough to keep the crown of the young plant level with the existing grade (just as it was growing in the cell pack or container). Make sure the crown is level and then fill the hole and firmly tamp around the roots to avoid air pockets.

Apply double-shredded mulch evenly over the bed approximately two inches thick, but avoid burying the crowns of the new transplants. Mulching is usually not necessary after the second growing season unless the "mulched look" is desired.

Stick plant labels next to each individual grouping. This will help identify the young native plants from non-desirable species (weeds) as you weed the garden.

As a general rule plants need one inch of water per week. Water immediately after planting and continue to water twice a week (unless rain does the job) until the plugs are established. You should not have to water your rain garden once the plants are established. Plugs can be planted anytime during the growing season as long as they get adequate water.

Fire safety

Make sure burning is allowed in your locale. If so, be sure to notify the local fire department and obtain a burn permit if needed. It's also wise – not to mention neighborly – to make sure the neighbors know that you're burning and that all safety precautions are being taken. Basic fire precautions include:

- Make sure there is a fire-break (non-burnable area, such as turfgrass) at least 10-feet wide surrounding the area to be burned.
- Never burn on windy days.
- Never leave an actively burning fire unattended.
- Keep a garden hose handy in case fire strays where it is not wanted. Also have a metal leaf rake in hand to beat out flames that creep beyond the burn zone.



Maintaining the rain garden

Weeding will be needed the first couple of years. Remove by hand only those plants you are certain are weeds. Try to get out all the roots of the weedy plants. Weeds may not be a problem in the second season, depending on the variety and tenacity of weeds present. In the third year and beyond, the native grasses, sedges, rushes, and wildflowers will begin to mature and will out-compete the weeds. Weeding isolated patches might still be needed on occasion.

After each growing season, the stems and seedheads can be left for winter interest, wildlife cover and bird food. Once spring arrives and new growth is 4-6-inches tall, cut all tattered plants back. If the growth is really thick, hand-cut the largest plants and then use a string trimmer to mow the planting back to a height of six to eight inches. Dead plant material can also be removed with a string trimmer or weed whacker (scythe) and composted or disposed of as appropriate.

The best way to knock back weeds and stimulate native plant growth is to burn off the dead plant material in the rain garden. However, burning is banned in most municipalities. Another option is to mow the dead plant material. If the mowing deck of your lawn mower can be raised to a height of six inches or so, go ahead and simply mow your rain garden. Then, rake up and compost or properly dispose of the dead plant material.

If the mower deck won't raise that high, use a string trimmer or weed-eater to cut the stems at a height of 6-8 inches. On thicker stems, such as cup plant, goldenrods and some asters, a string trimmer may not be strong enough. For these, use hand clippers or pruning shears to cut the individual stems.

What does a rain garden cost?

The cost of a rain garden will vary depending on who does the work and where the plants come from. If you grow your own plants or borrow plants from neighbors there can be very little or no cost at all. If you do all the work but use purchased prairie plants, a rain garden will cost approximately \$3 to \$5 per square foot. If a landscaper does everything, it will cost approximately \$10 to \$12 per square foot.

It might seem easiest to sow native wildflower seed over the garden, but experience shows that seeding a rain garden has its problems. Protecting the seeds from wind, flooding, weeds, and garden pests is very difficult, and the rain garden will be mostly weeds for the first two years. Growing plugs from seed indoors or dividing a friend's plants is much better. If you grow plugs, start them about four months before moving them to the rain garden. When the roots have filled the pot and the plants are healthy, they may be planted in the rain garden.

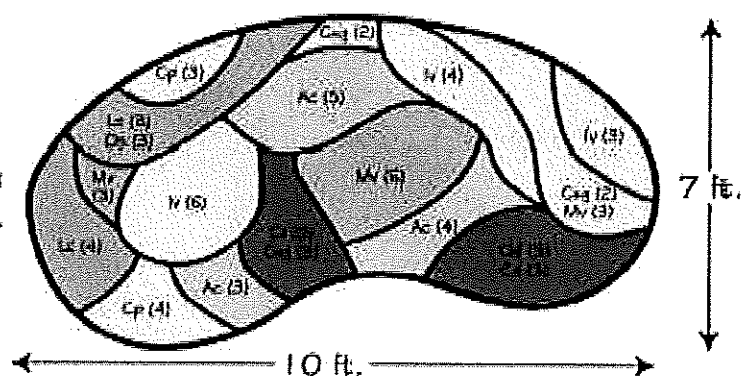
Rain Garden Designs and Plant Lists

The following pages contain conceptual planting designs and plant lists for rain gardens with varying sun and soil conditions. Keep in mind that design possibilities for rain gardens are almost limitless. Many landscape nurseries, particularly those specializing in native plants and landscaping, can provide other ideas, designs and suggested plants.

The following eight designs and plant lists have been provided by Applied Ecological Services, Inc., Brodhead, WI.

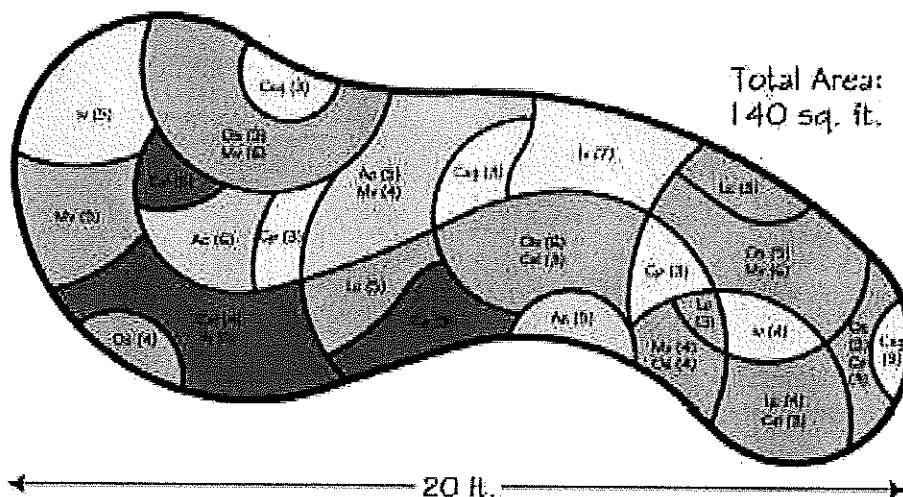


Total Area:
70 sq. ft.



Symbol	Species Name	Common Name	No. of Plants
Ac	<i>Ascoris calamus</i>	Sweet flag	12
Cc	<i>Campanula americana</i>	Tall bellflower	6
Cs	<i>Callitriche palustris</i>	Marsh mallow	7
Cxg	<i>Carex Grayi</i>	Bur sedge	7
Cxl	<i>Carex lupulina</i>	Hop sedge	3
ly	<i>Lin. virginica-sterile</i>	Wild blue flag iris	13
Lc	<i>Lobelia cardinalis</i>	Cardinal flower	7
Mv	<i>Mercurialis virginica</i>	Virginia bluebell	12
Os	<i>Oenothera biennis</i>	Evening primrose	3
Total Plants Needed			70

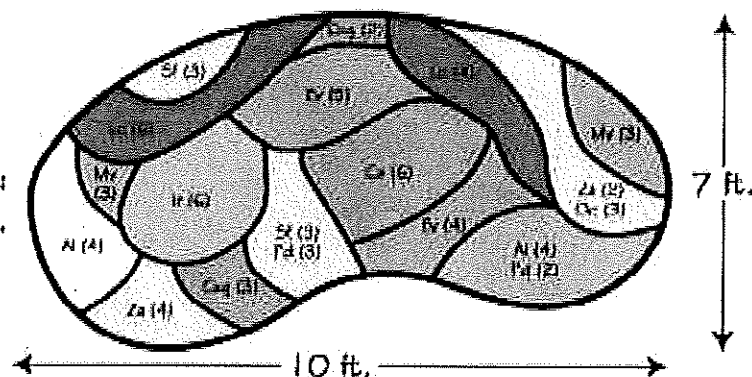
7 ft.



Symbol	Species Name	Common Name	No. of Plants
Ad	<i>Asonis calamagrostidis</i>	Sweet flag	16
Cp	<i>Callitriche palustris</i>	Marsh marigold	9
Cz	<i>Campanula americana</i>	Tall bellflower	5
Csg	<i>Carex Grayi</i>	Bur sedge	9
Dal	<i>Cardus lupulina</i>	Hop sedge	16
Iv	<i>Iris virginica-alba</i>	Wild blue flag iris	21
Lo	<i>LOBELIA cardinalis</i>	Cardinal flower	16
Mv	<i>Mertensia virginica</i>	Virginia bluebell	25
Os	<i>Oenothera serrulata</i>	Burdock fern	25
Total Plants Needed			140

10 feet
wide;
full to
partial
shade
with silty
& sandy
soils

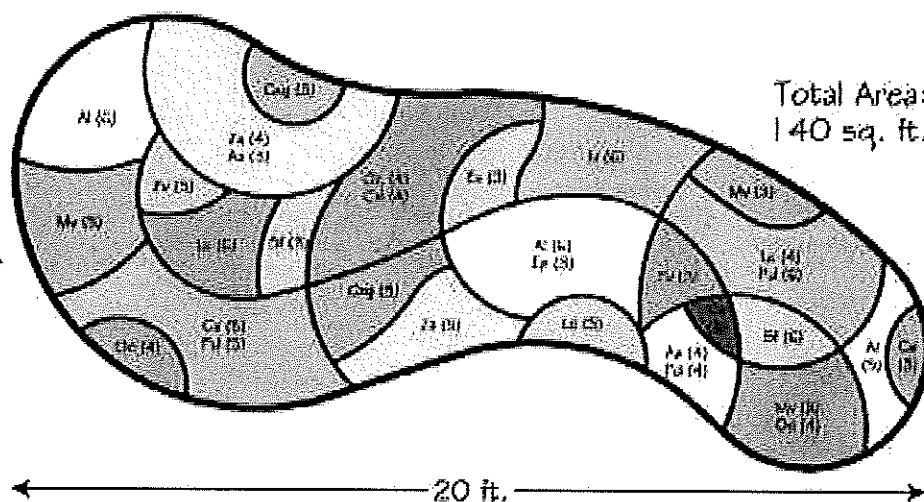
Total Area:
70 sq. ft.



Symbol	Species Name	Common Name	No. of Plants
Al	<i>Aster lateriflorus</i>	Side-flowering aster	8
Ca	<i>Campanula americana</i>	Tall bellflower	6
Cxg	<i>Carex Grayi</i>	Bur sedge	6
Ev	<i>Elymus virginicus</i>	Virginia wild rye	9
Iv	<i>Lin. virginica-shrevei</i>	Wild blue flag iris	6
Lc	<i>Lobelia cardinalis</i>	Cardinal flower	10
Mv	<i>Mertensia virginica</i>	Virginia bluebells	6
Oc	<i>Osmunda claytoniana</i>	Interrupted fern	3
Pd	<i>Phlox divaricata</i>	Woodland phlox	5
St	<i>Solidago flexuosa</i>	Zig zag goldenrod	6
Za	<i>Zinnia aurea</i>	Golden Alexander	6
Total Plants Needed			70

20 feet
wide;
full to
partial
shade
with silty
& sandy
soils

7 ft.

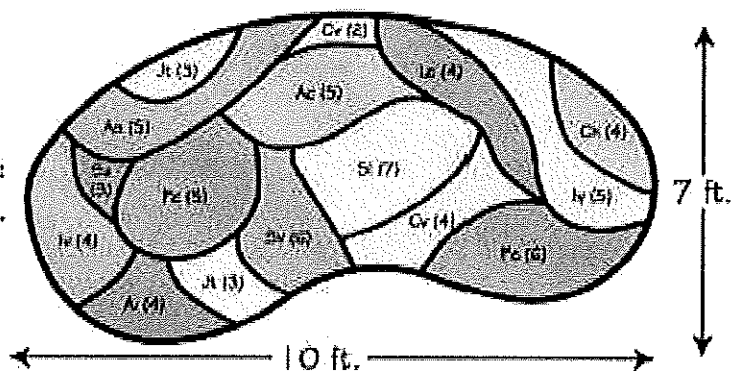


Total Area:
140 sq. ft.

Symbol	Species Name	Common Name	No. of Plants
As	<i>Anemone alabamica</i>	Jack-an-the-pumpkin	7
Al	<i>Aster lateriflorus</i>	Side-flowering aster	17
Ca	<i>Campanula americana</i>	Tall bellflower	8
Cxg	<i>Carex Grayi</i>	Bur sedge	8
Cal	<i>Carex lupulina</i>	Hop sedge	7
Ev	<i>Elymus virginicus</i>	Virginia wild rye	11
Ep	<i>Eupatorium purpureum</i>	Purple Joe-Pye weed	3
Iv	<i>Lin. virginica-shrevei</i>	Wild blue flag iris	6
Lc	<i>Lobelia cardinalis</i>	Cardinal flower	15
Mv	<i>Mertensia virginica</i>	Virginia bluebells	11
Oc	<i>Osmunda claytoniana</i>	Interrupted fern	12
Pd	<i>Phlox divaricata</i>	Woodland phlox	15
St	<i>Solidago flexuosa</i>	Zig zag goldenrod	9
Za	<i>Zinnia aurea</i>	Golden Alexander	14
Total Plants Needed			143

10 feet
wide;
full to
partial
sun
with clay
soils

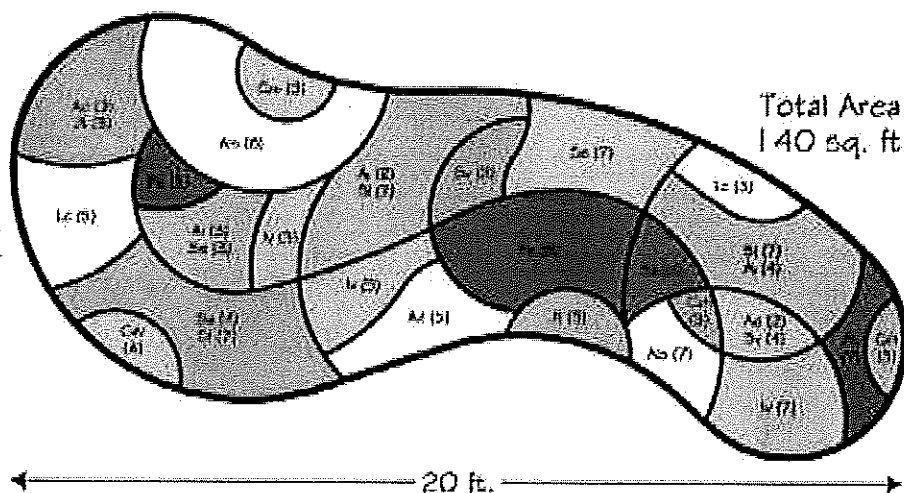
Total Area:
70 sq. ft.



Symbol	Species Name	Common Name	No. of Plants
Ac	<i>Acorus calamus</i>	Sweet flag	8
As	<i>Asclepias incarnata</i>	Swamp milkweed	4
Alk	<i>Alisma subcordatum</i>	Water plantain	5
Cxh	<i>Carex hystericina</i>	Bottle brush sedge	4
Crv	<i>Carex vulpinoidea</i>	Fox sedge	6
Iv	<i>Iris virginica-shrevei</i>	Wild blue flag iris	5
Jt	<i>Juncus torreyi</i>	Torrey's rush	6
Lc	<i>Lobelia cardinalis</i>	Cardinal flower	4
Pc	<i>Pontederia cordata</i>	Pickeral weed	11
Sl	<i>Sagittaria latifolia</i>	Arrowhead	7
Sv	<i>Scirpus atrovirens</i>	Green bulrush	3
Sv	<i>Scirpus validus creber</i>	Soft-stemmed bulrush	6
Total Plants needed			70

20 feet
wide;
full to
partial
sun
with clay
soils

7 ft.

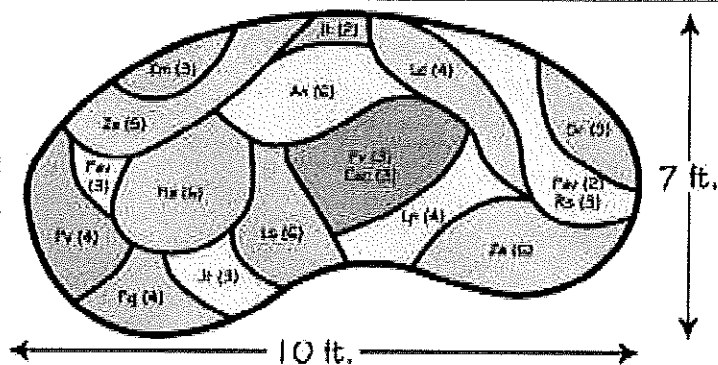


Total Area:
140 sq. ft.

Symbol	Species Name	Common Name	No. of Plants
Ac	<i>Acorus calamus</i>	Sweet flag	10
As	<i>Asclepias incarnata</i>	Swamp milkweed	9
Alk	<i>Alisma subcordatum</i>	Water plantain	15
Cxh	<i>Carex hystericina</i>	Bottle brush sedge	6
Crv	<i>Carex vulpinoidea</i>	Fox sedge	7
Iv	<i>Iris virginica-shrevei</i>	Wild blue flag iris	15
Jt	<i>Juncus torreyi</i>	Torrey's rush	8
Lc	<i>Lobelia cardinalis</i>	Cardinal flower	8
Pc	<i>Pontederia cordata</i>	Pickeral weed	21
Sl	<i>Sagittaria latifolia</i>	Arrowhead	21
Sv	<i>Scirpus atrovirens</i>	Green bulrush	7
Sv	<i>Scirpus validus creber</i>	Soft-stemmed bulrush	1
Se	<i>Spergulum eurycarpum</i>	Common bur-reed	10
Total Plants needed			144

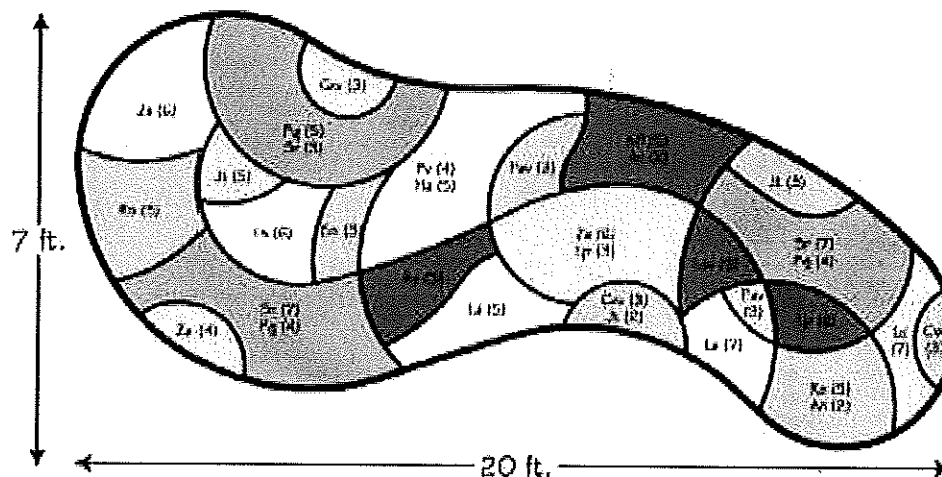
10 feet
wide;
full to
partial
sun with
silt and
sandy
soils

Total Area:
70 sq. ft.



Symbol	Species Name	Common Name	No. of Plants
An	<i>Aster novae-angliae</i>	New England Aster	6
Cx	<i>Carex comosa</i>	Bottlebrush sedge	3
Ep	<i>Eupatorium maculatum</i>	Spotted Joe-Pye weed	3
Ha	<i>Helenium autumnale</i>	Sneezeweed	6
Jt	<i>Juncus Torreyi</i>	Torrey's rush	5
Lp	<i>Liatris pycnostachya</i>	Gayfeather	4
Lc	<i>Lobelia cardinalis</i>	Cardinal flower	4
Ls	<i>Lobelia siphilitica</i>	Great blue lobelia	6
Pav	<i>Panicum virgatum</i>	Switch grass	5
Pq	<i>Phlox glaberrima</i>	Marsh phlox	4
Pv	<i>Pycnanthemum virginicum</i>	Mountain mint	7
Rn	<i>Rudbeckia subtomentosa</i>	Sweet coneflower	5
Za	<i>Zizia aurea</i>	Riddell's goldenrod	3
		Golden Alexander	11
Total Plants needed			72

20 feet
wide;
full to
partial
sun with
silt and
sandy
soils



Symbol	Species Name	Common Name	No. of Plants
An	<i>Aster novae-angliae</i>	New England Aster	9
Cx	<i>Carex vulpinaea</i>	Poa sedge	3
Ep	<i>Eupatorium maculatum</i>	Spotted Joe-Pye weed	3
Ha	<i>Helenium autumnale</i>	Sneezeweed	5
Jt	<i>Juncus Torreyi</i>	Torrey's rush	10
Lp	<i>Liatris pycnostachya</i>	Gayfeather	9
Lc	<i>Lobelia cardinalis</i>	Cardinal flower	7
Ls	<i>Lobelia siphilitica</i>	Great blue lobelia	9
Lt	<i>Lytium alatum</i>	Winged loosestrife	12
Ml	<i>Monarda fistulosa</i>	Wild Bergamot	5
Pav	<i>Panicum virgatum</i>	Switch grass	6
Pq	<i>Phlox glaberrima</i>	Marsh phlox	13
Pv	<i>Pycnanthemum virginicum</i>	Mountain mint	4
Rn	<i>Rudbeckia subtomentosa</i>	Sweet coneflower	10
Za	<i>Zizia aurea</i>	Riddell's goldenrod	17
		Golden Alexander	16
Total Plants needed			144

The following three designs and plant lists have been provided by Prairie Nursery, Inc., Westfield, WI



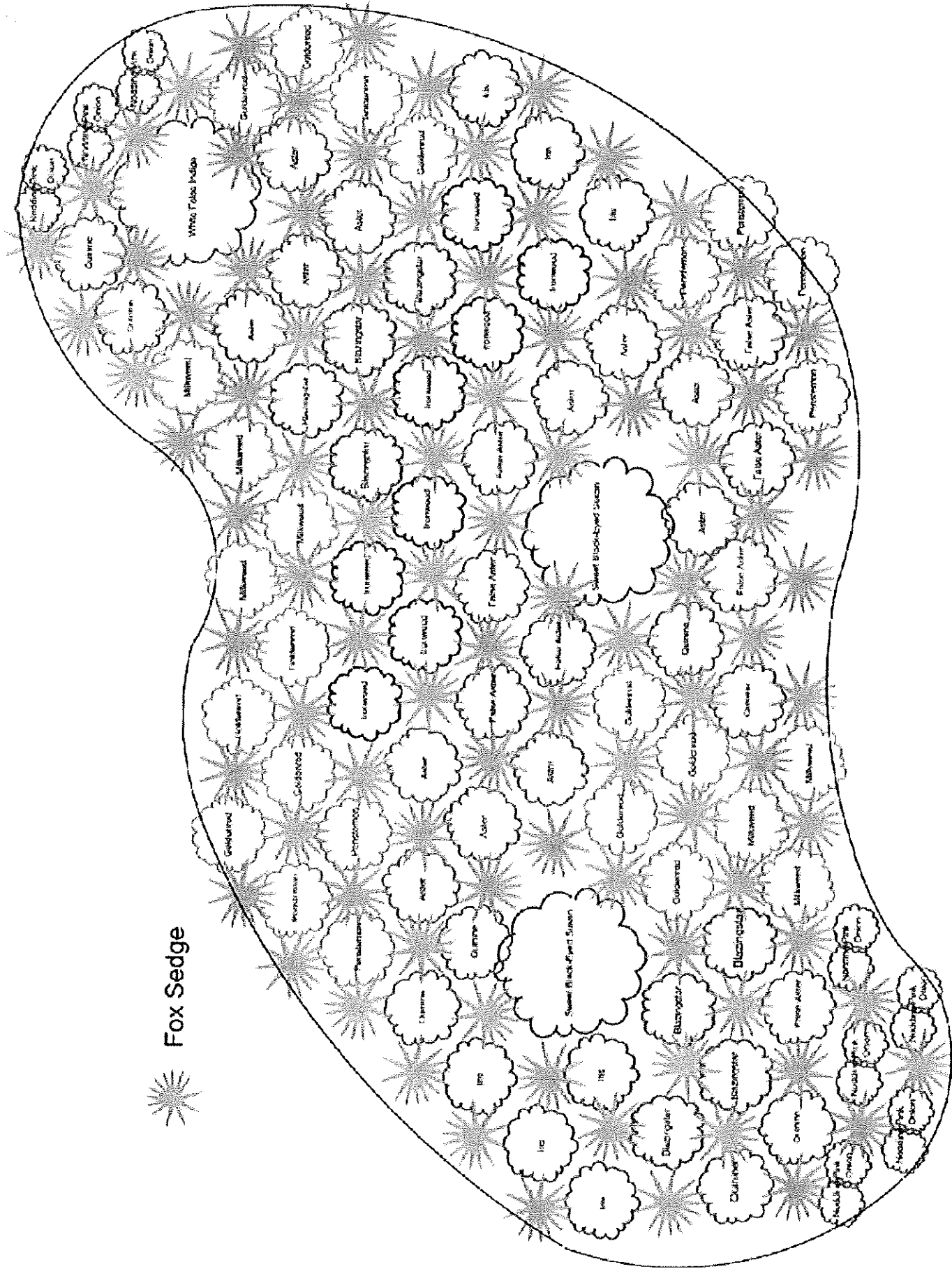
RAIN GARDEN FOR CLAY SOILS AND FULL SUN

AREA: 192 Square Feet

Designed to thrive through conditions of periodic water infiltrations as well as dry periods
 Designed to control 45% of annual runoff from an average sized rooftop (500 to 700 square feet)
 Install at least 10' from your foundation, in-line with a down-spout and/or downslope to intercept the rooftop water
 Depth of the garden designed to be 3.5" to 4" deep to hold about 200 gallons of water during periods of heavy rainfall

LATIN NAME	COMMON NAME	AMT	BLOOM TIME	BLOOM COLOR	HEIGHT	SPACING
<i>Asclepias incarnata</i>	Red Milkweed	7	early summer	red	3'-5'	1'
<i>Baptisia lactea</i>	White False Indigo	1	early summer	white	3'-5'	2'
<i>Iris versicolor</i>	Blue Flag Iris	7	early summer	blue	2'-3'	1'
<i>Perstemon digitalis</i>	Smooth Penstemon	7	early summer	white	2'-3'	1'
<i>Liatris pycnostachya</i>	Prairie Blazingstar	8	summer	pink	3'-5'	1'
<i>Parthenium integrifolium</i>	Wild Quinine	8	summer	white	3'-5'	1'
<i>Ratibida pinnata</i>	Yellow Coneflower	8	summer	yellow	3'-6'	1'
<i>Boltonia asteroides</i>	False Aster	8	late summer	white/pink	2'-4'	1'
<i>Rudbeckia subtomentosa</i>	Sweet Black-Eyed Susan	2	late summer	yellow	4'-6'	2'
<i>Vernonia fasciculata</i>	Ironweed	8	late summer	magenta	4'-6'	1'
<i>Aster novae-angliae</i>	New England Aster	12	fall	pink/purple	3'-6'	1'
<i>Solidago rigida</i>	Stiff Goldenrod	12	fall	yellow	3'-5'	1'
<i>Carex vulpinoidea</i>	Fox Sedge	96			1'-3'	1'

184 plants



Fox Sedge



RAIN GARDEN FOR LOAM TO SANDY/LOAM SOILS AND FULL SUN

AREA: 192 Square Feet

Designed to thrive through conditions of periodic water infiltrations as well as dry periods
 Designed to control 90% of annual runoff from an average sized rooftop (500 to 700 square feet)
 Install at least 10' from your foundation, in-line with a down-spout and/or downslope to intercept the rooftop water
 Depth of the garden designed to be 3.5' to 4' deep to hold about 400 gallons of water during periods of heavy rainfall

LATIN NAME	COMMON NAME	AMT	BLOOM TIME	BLOOM COLOR	HEIGHT	SPACING
<i>Asclepias incarnata</i>	Red Milkweed	7	early summer	red	3'-5'	1'
<i>Baptisia lactea</i>	White False Indigo	1	early summer	white	3'-5'	2'
<i>Iris versicolor</i>	Blue Flag Iris	7	early summer	blue	2'-3'	1'
<i>Perstemon digitalis</i>	Smooth Penstemon	7	early summer	white	2'-3'	1'
<i>Allium cernuum</i>	Nodding Pink Onion	16	summer	pink	1'-2'	6"
<i>Liatris pycnostachya</i>	Prairie Blazingstar	8	summer	pink	3'-5'	1'
<i>Parthenium integrifolium</i>	Wild Quinine	8	summer	white	3'-5'	1'
<i>Boltonia asteroides</i>	False Aster	8	late summer	white/pink	2'-4'	1'
<i>Rudbeckia subtomentosa</i>	Sweet Black-Eyed Susan	2	late summer	yellow	4'-6'	2'
<i>Vernonia fasciculata</i>	Ironweed	8	late summer	magenta	4'-6'	1'
<i>Aster novae-angliae</i>	New England Aster	12	fall	pink/purple	3'-6'	1'
<i>Solidago ohioensis</i>	Ohio Goldenrod	12	fall	yellow	3'-4'	1'
<i>Carex vulpinoidea</i>	Fox Sedge	96			1'-3'	1'

192 plants



RAIN GARDEN FOR SANDY SOILS AND FULL SUN

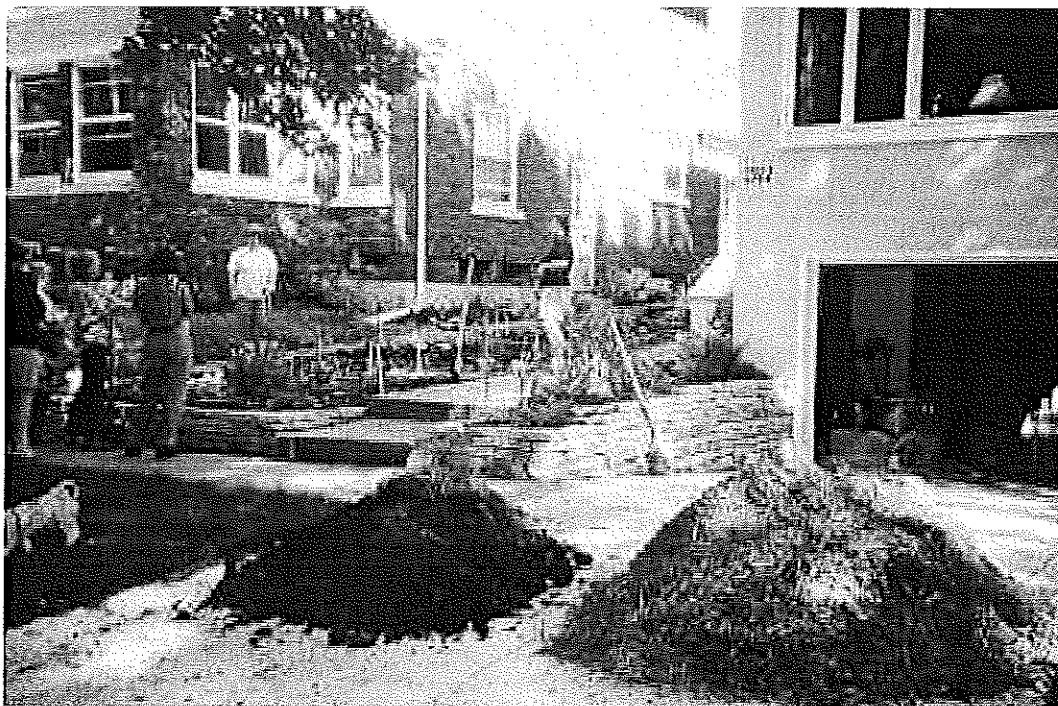
AREA: 128 Square Feet

Designed to thrive through conditions of periodic water infiltrations as well as dry periods
 Designed to control 90% of annual runoff from an average sized rooftop (500 to 700 square feet)
 Install at least 10' from your foundation, in-line with a down-spout and/or downslope to intercept the rooftop water
 Depth of the garden designed to be 3.5' to 4' deep to hold about 400 gallons of water during periods of heavy rainfall

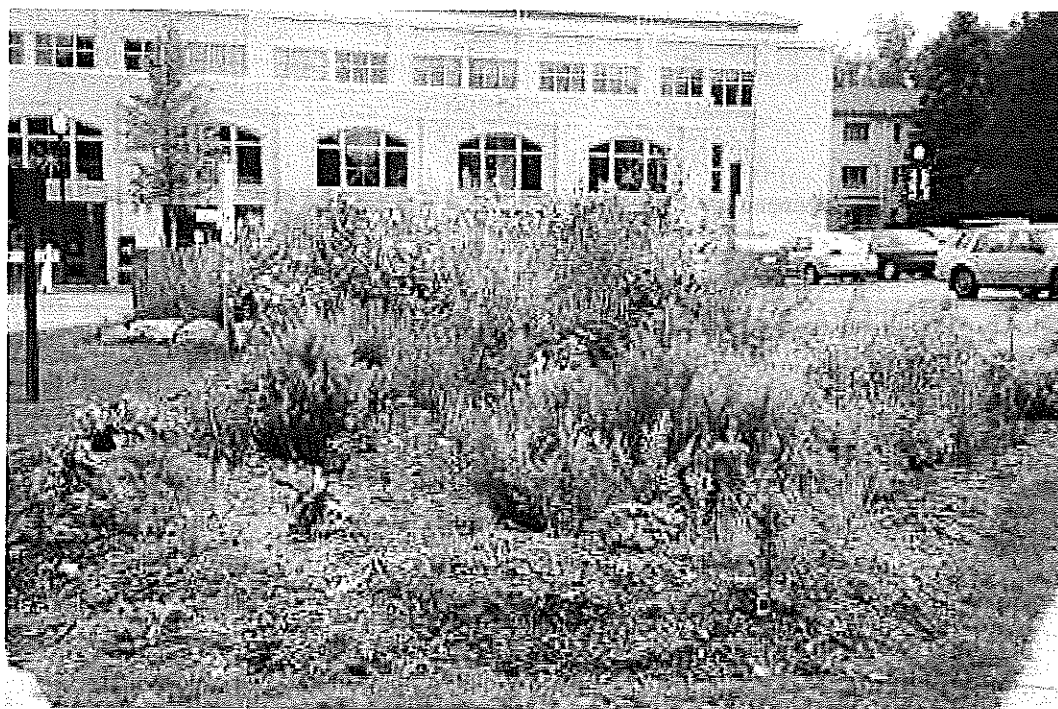
LATIN NAME	COMMON NAME	AMT	BLOOM TIME	BLOOM COLOR	HEIGHT	SPACING
<i>Asclepias incarnata</i>	Red Milkweed	4	early summer	red	3'-5'	1'
<i>Baptisia lactea</i>	White False Indigo	1	early summer	white	3'-5'	2'
<i>Iris versicolor</i>	Blue Flag Iris	4	early summer	blue	2'-3'	1'
<i>Penstemon digitalis</i>	Smooth Penstemon	4	early summer	white	2'-3'	1'
<i>Allium cernuum</i>	Nodding Pink Onion	18	summer	pink	1'-2'	6"
<i>Liatris pycnostachya</i>	Prairie Blazingstar	5	summer	pink	3'-5'	1'
<i>Parthenium integrifolium</i>	Wild Quinine	5	summer	white	3'-5'	1'
<i>Boltonia asteroides</i>	False Aster	4	late summer	white/pink	2'-4'	1'
<i>Rudbeckia subtomentosa</i>	Sweet Black-Eyed Susan	2	late summer	yellow	4'-6'	2'
<i>Vernonia fasciculata</i>	Ironweed	4	late summer	magenta	4'-6'	1'
<i>Aster novae-angliae</i>	New England Aster	8	fall	pink/purple	3'-6'	1'
<i>Solidago ohioensis</i>	Ohio Goldenrod	8	fall	yellow	3'-4'	1'
<i>Carex vulpinoidea</i>	Fox Sedge (sedge)	64	1'-3'	1'		

128 plants

Special Rain Garden Locations



In addition to conventional lawns, there are other locations where rain gardens can be created. A rectangular-shaped rain garden (above) was located in a narrow sideyard between two homes. With a new rain garden (below), a lawn area near a parking lot now helps control runoff pollution.



Rain garden designs and
plant lists provided by John
Gishnock, Applied Ecological
Services, Inc. (pages 19-22)
and Jennifer Baker, Prairie
Nursery Inc. (pages 24-29).



RAIN GARDENS

A how-to manual for homeowners



A frosted rain garden
in autumn.

This publication developed by Roger Bannerman, Wisconsin Department of Natural Resources and Ellen Considine, U.S. Geological Survey. Special thanks to John Gishnock, Applied Ecological Services, Inc., Jennifer Baker, Prairie Nursery Inc. and Joyce Powers, CRM Ecosystems Inc.

Photos by Roger Bannerman, Wisconsin Department of Natural Resources

Layout design/production by Jeffrey Strobel, and editorial assistance by Bruce Webendorfer, University of Wisconsin-Extension Environmental Resources Center.

This publication is available from county UW-Extension offices, Cooperative Extension Publications, 1-877-047-7827 and from DNR Service Centers.

The publication can also be viewed and printed from pdf format on the web at clean-water.uwex.edu/pubs/raingarden

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Wisconsin Department of Natural Resources
DNR Publication PUB-WT-776 2003



University of Wisconsin-Extension
UWEX Publication GW0037
1-06-03-5M-100-5

Wisconsin Native Plant Sources

and Restoration Consultants

Seeds & plants for prairies, woodlands, wetlands & shorelands



Shoreland Stewardship Series: This is the fifth in a series of publications describing the impacts of shoreland development on water quality, and fish and wildlife habitat, and includes recommendations for waterfront property owners to limit those impacts. Available from UW-Extension, publications #GWQ027, #GWQ038, #GWQ039, and #GWQ040, or from the DNR, publications #FH-428, #FH-429, WT-748 and WT-764.

The Wisconsin Department of Natural Resources acknowledges the Environmental Protection Agency's Region V (through Section 319 of the Clean Water Act) for their involvement in the partial funding of this publication.

The list of landscape nurseries in this publication is current as of March, 2004. Mention of nurseries does not constitute an endorsement by University of Wisconsin-Extension or the Wisconsin Department of Natural Resources.

By Gretchen Messer, and updated by Carmen Wagner, Wisconsin Department of Natural Resources.

Layout design/production by Jeffrey Strobel and Lisa Zukowski, University of Wisconsin-Extension Environmental Resources Center.

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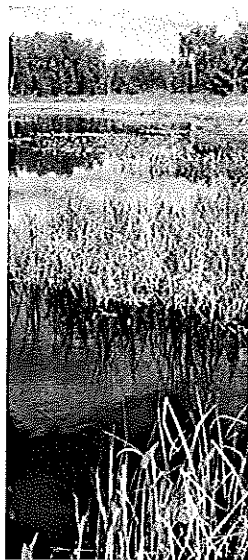
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DNR PUB WT-802



UWEX publication GWQ041



Wisconsin Native Plant Sources

and Restoration Consultants

Seeds & plants for prairies, woodlands, wetlands & shorelands



Wisconsin Native Plant Sources

This publication provides a list of nurseries and native restoration consultants that can help make your natural landscaping plan a reality. The list includes companies in Wisconsin and nearby in neighboring states. Often, nurseries near to you sell local genotypes of plants that are better suited to local conditions.

Native species can be used in a variety of landscape settings and have numerous advantages over introduced species:

- adapted to the area's unique soil and climate conditions;
- need less maintenance – reducing the need for fertilizer or pesticides;
- often provide better erosion control due to their deeper root systems;
- have greater survival rates;
- provide food and habitat for native wildlife species.

Shorelands are especially appropriate for natural landscaping because buffers of native plants near water can help keep soil, nutrients and other pollutants out of our streams and lakes.

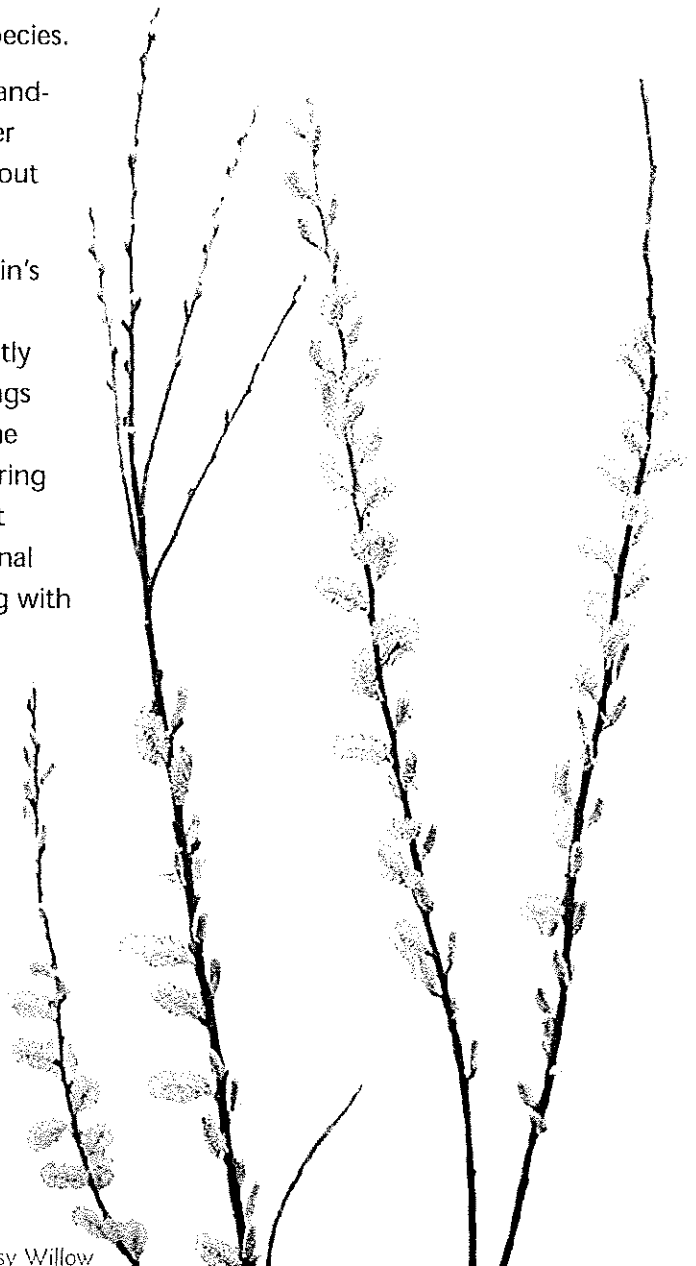
So many people are building homes near Wisconsin's waters that many lakeshores and streambanks are now growing more houses than trees – permanently altering a portion of the natural landscape. Buildings and access drives replace vegetation, increasing the amount of storm water runoff and pollutants entering the lake or stream. Much of this new development brings traditional ideas centered on the conventional yard. Too often that means manicured lawns along with the fertilizer and pesticide applications.

The impacts of development can be minimized through the use of careful site plans and with landscaping plans that place less emphasis on lawns and incorporate a variety of plants adapted to the area's natural habitat.

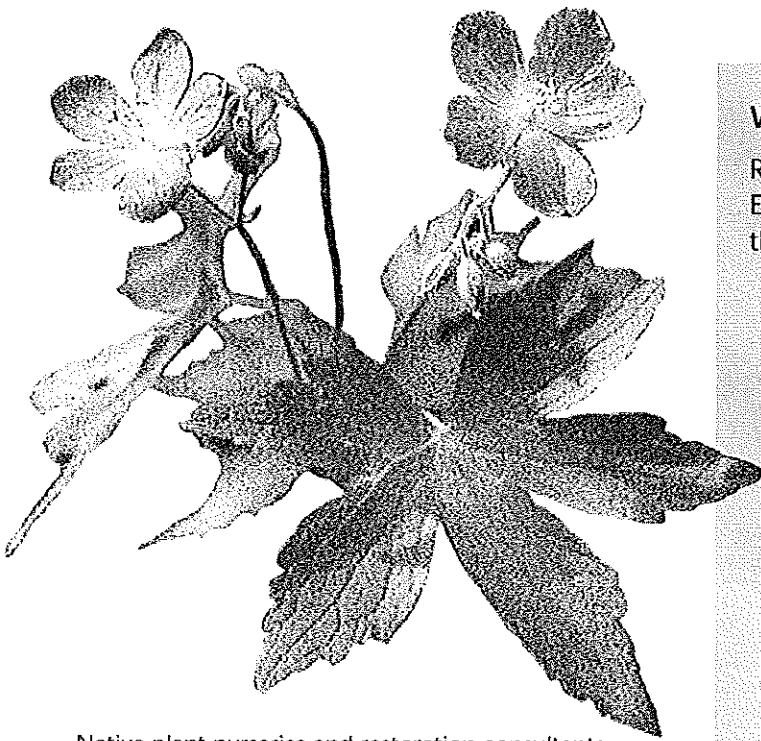
Access to native plant species for small projects on residential lots as well as for large-scale resource restoration projects associated with major development activities is necessary to encourage the use of vegetation best suited to local climate and soil conditions.

Please note:

Some native plants are collected from the wild, while others are grown on-site. We recommend that you ask nurseries about the source of various plants.



Pussy Willow



Native plant nurseries and restoration consultants can help you with your natural landscaping project – whether it is a postage-stamp sized prairie planting in downtown Milwaukee or 500 feet of shoreline in northern Wisconsin. The range of services, products and information will vary from company to company – you just need to find the right one for you.

Some companies may only provide seed or plant materials – and most are very willing to help you make the correct selections for your site. Others will draw up a plan, supply the materials, install them, and maintain them for you. The choice is yours for what level of involvement you want for your project.

Make sure to explain your needs and desires for your project: Do you only want to use native species and avoid improved cultivars? Do you want to use seed and plant material from a local source (within 50 miles of your project)? Do you want to do the work yourself or are you looking for someone to do the work for you? The better you can explain your expected outcome from the project – the better your relationship will be with the company you select.

The list of nurseries in this publication is not an endorsement of the firms, and is not meant as a way to bypass local growers and suppliers. It simply offers another way to obtain quality seeds and plants. In developing this list, we emphasized suppliers providing plants native to Wisconsin. The list omits nurseries requiring large orders, those dealing on a mail-order only basis, and those in distant locations offering a limited selection.

What is a Successful Restoration?

Restoring natural landscapes is challenging. Ecologists use several benchmarks to judge the success of a restoration.

Sustainability: Is the reconstructed community capable of perpetuating itself, or, like a corn field or a golf course, can it be sustained only if continuously managed by people?

Resistance to Invasion: Does the reconstruction yield a community that resists invasions by new species? Intact, natural communities are, in general, less easily invaded than ones that have been damaged or ones that lack one or more of their key species.

Productivity: A restored community should be as productive as the original community.

Nutrient Retention: A reconstructed community should lose lesser amounts of nutrients than the original. In the long run it will prove to be unsustainable because it will be invaded by new species and its productivity will decline.

Biotic Interactions: The reassembly of formerly associated plant populations often leads to reconstruction of the entire community. Because of their mobility and ubiquity, animals and microbes usually colonize spontaneously.

Ecologists who successfully re-create a natural landscape have reason to be proud. But even those who are unsuccessful in meeting some of the benchmarks gain new insight into the plant community.

Adapted from:
John J. Ewel – "Restoration is the ultimate test of ecological theory" in: *Restoration Ecology, A Synthetic Approach to Ecological Research*, 1987

Learn more about these native ecosystems:

PRAIRIES



The prairie is a plant community dominated by grass rather than by trees. Growing with the grasses are many species of non-grassy herbs which are known by the collective name "forbs." Many woody shrubs can be present in the prairie as well, and, under certain circumstances, tree seedlings may also be found.

Source: John T. Curtis,
Vegetation of Wisconsin

Patches of prairie, called remnants, are scattered throughout the southwest half of Wisconsin. These remnants are interesting to view and study, and serve as seed sources for restoration projects. Prairie remnants can be found in neglected areas such as:

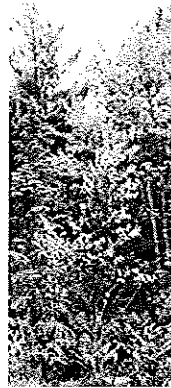
- 1 Railroad rights-of-way. Many rail lines were built before the land was farmed. Burning on rights-of-way enhanced the growth of prairie species.
- 2 Pioneer cemeteries – if they have not been tidied up too much.
- 3 Large wetland areas may have wet-to-dry prairies in their centers isolated from access by cattle or machinery.
- 4 Large areas of irregular topography – areas too steep to plow, or even too steep to graze, especially on the south side of hills.
- 5 Areas of poor agricultural soils. There are many prairie remnants in the sand counties of Wisconsin.

"Some people say a prairie is a state of mind. Scientists believe it is close to being the most complex, yet the most balanced ecosystem on earth."

The Prairie Garden,
J. Robert Smith, 1980

Source:
UW-Extension
publication G2736,
Prairie Primer, UW-Extension

WOODLANDS



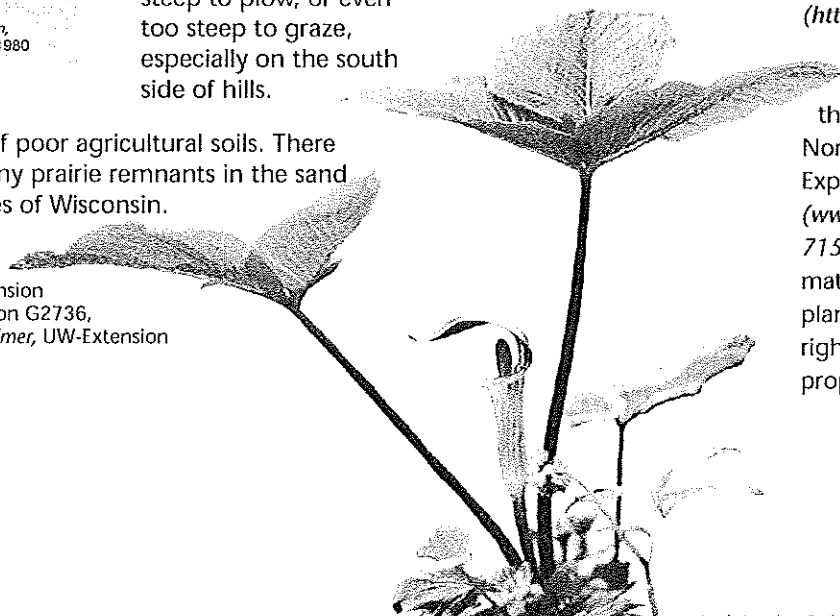
Woodlands once occupied much of Wisconsin, but heavy logging in the 1800s and early 1900s greatly reduced the number of mature forested acres. Since the 1930s, however, the state began to see an increase in forest acreage, and today Wisconsin has 16 million acres of forest, with nearly 70 percent under private ownership. The greatest threat to today's woodlands comes not from logging, but from development.

Properly managed woodlands provide beauty, recreation, wildlife habitat, and help protect water quality in our streams and lakes. Trees and woodlands in urban areas can provide additional benefits:

- Shade cooling air, buildings and streets;
- Block or direct winds;
- Reduce certain air pollutants;
- Sound reduction;
- Glare reduction;
- Minimize wind, water and construction site erosion;
- Assist stormwater management.

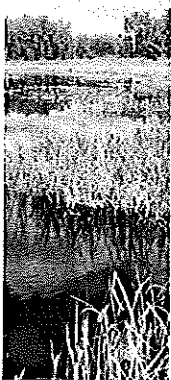
Source: Robert W. Miller, *Urban Forestry, Planning and Managing Urban Greenspaces*, 1997

Check Wisconsin's State Nursery Program (<http://dnr.wi.gov/org/land/forestry/Nursery/> or 608/266-7891) or the USDA Forest Service North Central Forest Experiment Station (www.ncrs.fs.fed.us/ or 715/362-7474) for information about selecting, planting and managing the right trees for your property.



Jack-in-the-Pulpit

WETLANDS



Wetlands often function like natural tubs or sponges, storing water (floodwater, or surface water that collects in isolated depressions) and slowly releasing it. Trees and other wetland vegetation help slow floodwaters. This combined action – storage and slowing – can lower flood heights and reduce the water's erosive potential.

Wetlands help improve water quality, including that of drinking water, by intercepting surface runoff and removing or retaining its nutrients, processing organic wastes, and reducing sediment before it reaches open water.

The U.S. Fish and Wildlife Service estimates that up to 43 percent of the threatened and endangered species rely directly or indirectly on wetlands for their survival.

Over 10 million acres of wetlands were originally thought to have existed in Wisconsin. Since then, extensive losses have occurred, and over half of our original wetlands have been drained and converted to other uses. The years from the mid-1950s to the mid-1970s were a time of major wetland loss, but since then the rate of loss has decreased.

Recent estimates of national wetlands trends on non-federal lands indicate a loss rate of between 70,000 to 90,000 acres annually.

Source: U.S. Environmental Protection Agency

Major Causes of Wetland Loss and Degradation:

Human Actions

- Drainage
- Dredging and stream channelization
- Deposition of fill material
- Diking and damming
- Tilling for crop production
- Levees
- Logging
- Mining
- Construction
- Stormwater runoff

- Air and water pollutants
- Changing nutrient levels
- Releasing toxic chemicals
- Introducing non-native species
- Grazing by domestic animals

Natural Threats

- Erosion
- Droughts
- Storms

SHORELANDS



A natural shoreline is a bridge between two worlds. Studies show that there can be as much as 500 percent more diversity of plant and animal species along a natural shoreline compared to upland areas.

Wisconsin laws safeguard waters and the shoreland buffers that shield them. In the 1960s, the state legislature established the Wisconsin Shoreland Management Program. It directed the Department of Natural

Resources to adopt guidelines for county shoreland protection ordinances.

The guidelines describe a shoreland buffer as a strip of land extending 35 feet inland from the ordinary high water mark (OHWM), where no more than 30 feet in any 100 feet of shoreline may be clear cut to remove trees and shrubbery.

A significant body of research however suggests that a 35-foot shoreland buffer is inadequate in providing protection to the waterways from various pollutants. Accordingly, many Wisconsin counties have classified their waters based on size, biological indicators and sensitivity to development and have established greater building setbacks and buffer requirements.

For more information, check with the county or DNR, or the Natural Resource Conservation Service (a part of the U.S. Department of Agriculture).



Take a Frog Walk

Eleven frog species and one toad live in Wisconsin. Unfortunately, the bullfrog and the leopard frog are declining in numbers, and the cricket frog is now classified as endangered.

The frogs you hear as you take a walk along a stream will change throughout the seasons.

Beginning in April, you may hear wood frogs, chorus frogs and spring peepers. With warmer weather in May, you may hear leopard frogs, pickerel frogs and toads.

From the end of May through to August, you may hear the eastern tree frog, coles tree frog, cricket frog, mink frog, green frog and even bullfrog.

Wisconsin has an annual frog and toad monitoring survey where volunteers assess the number of frogs of each species.

For more information regarding frogs and frog surveys, contact the Wisconsin Department of Natural Resources, Bureau of Endangered Resources, Box 7921, Madison, WI 53707.

Wisconsin Native Plant Sources

LOCATED IN WISCONSIN																	
Nursery	Wetland			Shoreland			Prairie			Woodland			Services				
	P/C	S	T/S	P/C	S	T/S	P/C	S	T/S	P/C	S	T/S	D	SP	I	M	B
Agrecol – 2918 Agriculture Dr., Madison, WI 53718 (608) 226-2544 www.agrecol.com	*	*		*	*		*	*		*	*		*	*	*	*	*
Applied Ecological Services/Taylor Creek Restoration Nursery – 17921 Smith Road, Brodhead, WI 53520 (608) 897-8641 www.appliedeco.com	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*
Aquatic Biologists, Inc. – N4828 US Hwy 45, Fond du Lac, WI 54935 (920) 921-6827 www.aquaticbiologists.com	*	*		*	*								*	*	*	*	*
Aquatic Resources and Glacial Pond Farms – N 4546 Butternut Lane, Birnamwood, WI 54414 (715) 845-2099	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Arboretum & Natural Gardens – S7375 Hwy 14, Readstown, WI (608) 629-5553 www.readscreeknursery.com	*		*	*		*	*	*	*	*	*	*	*	*	*	*	*
BioLogic Environmental Consulting, LLC – 2505 Richardson St., Fitchburg, WI 53711 (608) 277-9960	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Bluestem Farm – S5920 Lehman Road Baraboo, WI 53913 (608) 356-0179	*		*				*	*	*	*	*	*	*				
Dragonfly Gardens – 491 State Hwy 46 P.O. Box 192, Amery, WI 54001 (715) 268-4666 http://dragonflygardens.net	*		*	*			*	*	*	*	*	*	*	*	*	*	*
Dutch Designs – N5706 Hwy S, Lake Mills, WI 53551 (920) 648-8234	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Eco-Building & Forestry – 1058 DuBay Drive West, Mosinee, WI 54455 (715) 344-2817 www.eco-buildingandforestry.com	*		*	*		*	*	*	*	*	*	*	*	*	*	*	*
Flower Factory – 4062 Hwy. A, Stoughton, WI 53589 (608) 873-8329	*			*			*			*			*				
Gentian Farm – 2775 18 Avenue, Osceola, WI 54020 (715) 294-2724		*			*		*	*		*			*		*	*	*
Great Lakes Nursery Co. – 1002 Hamilton Street, Wausau, WI 54403 (715) 845-7752, toll-free 888-733-3564	*		*	*		*	*	*	*	*	*	*	*				
Hanson's Garden Village – 2660 Cty Rd. G, Rhinelander, WI 54501 (715) 365-2929	*		*	*		*	*			*			*				
Hild & Associates – 326 Glover Road River Falls, WI 54022 (715) 426-5131 www.hildnatives.com	*	*		*	*		*	*		*	*		*	*	*	*	*
J&J Transplant Aquatic Nursery – W 4980 Country Rd. West, Wild Rose, WI 54984 (800) 622-5055 www.transplant.com	*	*	*	*	*	*	*	*	*	*	*	*					
Johnson's Nursery Inc – W180 N6275 Marcy Road, Menomonee Falls, WI 53051 (262) 252-4988 www.johnsonsnursery.com	*		*	*		*	*	*	*	*	*	*	*	*	*	*	*

P/C = Plug/Container S = Seed T/S = Trees/Shrubs D = Design SP = Site Preparation I = Installation M = Management B = Prescribed Burns

LOCATED IN WISCONSIN (continued)

Nursery	Wetland			Shoreland			Prairie			Woodland			Services				
	P/C	S	T/S	P/C	S	T/S	P/C	S	T/S	P/C	S	T/S	D	SP	I	M	B
Kester's Wild Game Food – 4582 Hwy 116E P.O. Box 516, Omro, WI 54963 (800) 558-8815	•	•		•	•		•	•					•	•	•		•
Kettle Moraine Natural Landscaping – W996 Birchwood Dr., Campbellsport, WI 53010 (920) 533-8939		•			•			•					•		•	•	•
Klunnickinnic Natives – 235 State Rd 65 River Falls, WI 54022 (715) 425-7605				•			•	•		•	•		•		•		
Lacewing – 6087 N. Denmark St., Milwaukee, WI 53225 (414) 358-2562	•	•	•	•		•	•	•		•		•	•	•	•	•	•
Lied's Nursery Company Inc. – N63 W22039 Hwy. 74, Sussex, WI 53089 (262) 246-6901 www.lieds.com	•			•			•	•					•	•	•	•	•
Lodholz North Star Acres, Inc. – 420 Highway A, Tomahawk, WI 54487 (715) 453-2976			•			•		•				•			•		
Marshland Transplant Aquatic and Woodland Nursery – P.O. Box 1, Berlin, WI 54923 (920) 361-4200	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Monches Farm – 5890 Monches Road Colgate, WI 53017 (262) 966-2787 www.monchesfarm.com	•						•			•							
National Wild Turkey Federation – 265 Lorrie Way, DePere, WI 54115 (920) 427-2335 www.nwtf.org	•	•	•	•	•	•	•	•	•	•	•	•	•				•
Northern Native Plantscapes – 25350 S. Garden Ave., Cable, WI 54821 (715) 794-2548	•		•	•		•	•			•	•	•	•	•	•	•	•
Oak Prairie Farms – W4642 Highway 33 Pardeeville, WI 53954 (608) 429-3882 www.oakprairiefarm.com	•	•		•	•		•	•		•	•		•		•		
Prairie Futures Seed Co. – P.O. Box 644 Menomonee Falls, WI 53052 (262) 820-0221				•	•		•	•		•	•		•	•	•	•	•
Prairie Nursery – W5875 Dyke Ave. P.O. Box 306, Westfield, WI (608) 296-3679 www.prairienursery.com	•	•		•	•		•	•		•	•		•	•	•	•	•
Prairie Ridge Nursery – 9738 Overland Road, Mt. Horeb, WI 53572 (608) 437-5245 http://prairieridgenursery.com	•	•		•	•		•	•		•	•		•	•	•	•	•
Prairie Seed Source – P.O. Box 83 North Lake, WI 53064-0083 (414) 673-7166		•			•			•								•	
Tallgrass Native Seed – 2705 11th Ave., Monroe, WI 53566 (608) 325-9374		•						•			•		•	•		•	•
The Plantscapers – E2051 Luxembourg, WI 54217 (262) 845-5196	•	•		•		•	•	•		•		•	•	•	•	•	•

Wisconsin Native Plant Sources

P/C = Plug/Container S = Seed T/S = Trees/Shrubs D = Design SP = Site Preparation I = Installation M = Management B = Prescribed Burns

LOCAL/IN WISCONSIN (continued)

Nursery	Wetland			Shoreland			Prairie			Woodland			Services				
	P/C	S	T/S	P/C	S	T/S	P/C	S	T/S	P/C	S	T/S	D	SP	I	M	B
Wallace – Woodstock Nursery – W6291 State Rd. 95, Neillsville, WI 54456 (888) 803-8733 www.wallace-woodstock.com	e		e	e		e	e		e	e		e					e
Wildlife Nurseries Inc. – 904 Bauman St., P.O. Box 2724, Oshkosh, WI 54903 (414) 231-3780	e	e		e	e		e	e									
Windy Oaks Aquatics – W377 S10677 Betts Road, Eagle, WI 53119 (262) 594-3033	e			e													e
Winter Greenhouse – W7041 Olmstead Rd., Winter, WI 54896 (715) 266-4963	e		e	e		e	e		e	e		e					
Woods' Edge Farm – 532 Stanek Road Muscodia, WI 53573 (608) 739-3527 www.woodsedgefarm.com										e		e					



LOCATED IN NEARBY STATES

Nursery	Wetland			Shoreland			Prairie			Woodland			Services				
	P/C	S	T/S	P/C	S	T/S	P/C	S	T/S	P/C	S	T/S	D	SP	I	M	B
Cascade Forest Nursery – 22033 Fillmore Rd., Cascade, IA 52033 (319) 852-3042 cascade@netins.net			*			*			*			*					
Cold Stream Farm – 2030 Free Soil Road Free Soil, MI 49411 (231) 464-5809			*			*			*			*					
Enders Greenhouse – 104 Enders Drive Cherry Valley, IL 61016 (815) 332-5255	*			*			*	*	*	*	*	*					
Ion Exchange – 1878 Old Mission Drive Harper's Ferry, IA 52146 (319) 535-7231	*	*	*	*	*	*	*	*	*	*	*	*					
J.F. New & Associates, Inc. – 708 Roosevelt Road, Walkertown, IN 46574 (219) 586-3400	*	*	*	*	*	*	*	*	*	*	*	*					
Lafayette Home Nursery, Inc. – Rt. 1, Box 1A, Lafayette, IL 61449 (309) 995-3311	*	*	*	*	*	*	*	*	*	*	*	*					
Nature's Acres – 14088 Hwy 95 NE, Foley, MN 56329 (320) 968-4222				*		*	*	*	*				*	*	*	*	*
North American Prairies – 111754 Jarvis Ave. NW, Annandale, MN 55056 (320) 274-5316	*			*			*			*							
Prairie Hill Wild Flowers/Wild Rose Greenhouse – 8955 Lemonde Rd., Ellendale, MN 56026 (507) 451-7791	*						*										
Prairie Moon Nursery – Rt. 3 Box 163 Winona, MN 55987 (507) 452-1362 www.prairiemoonnursery.com	*	*	*	*	*	*	*	*	*	*	*	*					
Prairie Restorations Inc. – P.O. Box 327 Princeton, MN 55371 (763) 389-4342 www.prairieresto.com	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Prairie Wild Enterprises, Inc. – 275 E. 4th Street South, Cottonwood, MN 56329 (507) 423-5575 www.prairiewild.com	*	*	*	*	*	*	*	*	*				*	*	*	*	*



D = Design SP = Site Preparation I = Installation M = Management B = Prescribed Burns

Additional consultants located in Wisconsin

Consultant	Services				
	D	SP	I	M	B
Bison Belly Futures – S11793 Hazelnut Rd., Spring Green, WI 53533 (608) 588-2048	•		•	•	
Blue Ox Forestry Service – P.O. Box 46, Dodgeville, WI 53533 (608) 935-3241	•				•
Clark Forestry – P.O. Box 88, Baraboo, WI 53913 (608) 356-2403 www.clarkforestry.com	•	•	•	•	•
Country Wetlands Nursery – S87 W18193 Woods Rd., Muskego, WI 53150 (262) 679-8003	•	•	•	•	
Driftless Land Stewardship, LLC – 13058 Rock School Rd., Glen Haven, WI 53810 (608) 794-2724 www.driftlesslandstewardship.com	•	•	•	•	•
Environmental Concepts Inc. – P.O. Box 969, Twin Lakes, WI 53181 (262) 877- 8760 www.enviroconcepts.us	•	•	•	•	•
Lawson Ridge Native Landscaping, Inc. – Landscaping, Inc. – W8181 Hwy E, Oxford, WI 53952 (608) 296-3505 www.prairierestoration.com	•	•	•	•	
LJ Reas Environmental Consulting Corp. – P.O. Box 383, Green Lake, WI 54941 (920) 294-3116 www.ljreas.com	•	•	•	•	
Michler & Brown, LLC – 5110 Odana Rd., Madison, WI 53711 (608) 767-4322		•	•	•	•
Midwest Prairies LCC – N1020 Vinnie Ha Ha Rd., Fort Atkinson, WI 53538 (920) 563-3165 www.midwestprairies.com	•	•	•	•	•
NES Ecological Services A Division of Robert E. Lee & Associates – 4664 Golden Pond Court, Oneida, WI 54155 (920) 499-5789 www.releecinc.com/NES/	•		•		
Pheasants Forever, Inc. – W9947 Ghost Hill Rd., Beaver Dam, WI 53916 (920) 927-3579	•	•	•	•	•
Prairie Hawk Restorations, Inc. – 205 E. Merrimac St., Dodgeville, WI 53533 (608) 935-9586	•	•	•	•	•
Stone Tool Native Landscaping – P.O. Box 1774, Woodruff, WI 54568-1774 (715) 356-7855 www.schcongo.com		•	•		



Continued use of native plant species in and around our developed landscape can work to create a new aesthetic – one that respects the functions and structure of natural systems.

Additional Resources

Getting the Help You Need: People and Dollars for Wildlife (WM-219-2002) – Available from local DNR service centers

Lakescaping for Wildlife and Water Quality – Available from Minnesota Bookstore, 1-800-657-3757

Wetland Restoration Handbook for Wisconsin Landowners (SS-989 2004) – Available from local DNR service centers

DNR Waterfront Property Owners	www.dnr.wi.gov/org/water/fhp/waterfront.htm
Invasive Plants Association of Wisconsin	http://ipaw.org/
Lady Bird Johnson Wildflower Center	www.wildflower.org
U.S. EPA Green Landscaping with Native Plants	www.epa.gov/greenacres
USDA Plants Database	http://plants.usda.gov/
UWEX Wisconsin Shorelands	www.uwex.edu/ces/shoreland
UWGB Cofrin Center for Biodiversity Herbarium	www.uwgb.edu/biodiversity/herbarium/
UWSP Robert W. Freckmann Herbarium	http://wisplants.uwsp.edu/index.html
Wild Ones Natural Landscapers Ltd.	www.for-wild.org
Wildlife Habitat Council	www.wildlifehc.org
Wisconsin State Herbarium	www.botany.wisc.edu/herbarium/
Wisconsin Wetlands Association	www.wiscwetlands.org
Wisconsin Woodlands Owners Association	www.wisconsinwoodlands.org

Glossary of Terms

Community: A studiable grouping of organisms which grow together in the same general place and have mutual interactions. (1)

Ecosystem: The organisms of a particular habitat, such as a pond or forest, together with the physical environment in which they live: community of plants and animals generally in equilibrium with inputs of energy and materials in their particular environment.

Environment: Sum of all the physical (non-living) and biological (living) factors that affect an organism.

Erosion: The wearing down or washing away of the soil and land surface by the action of water, wind or ice. (2)

Forb: Herbaceous plant other than grass.

Habitat: The environment in which an organism lives.

Herbicide: Agent used to inhibit or destroy plant growth.

Invasive Species: One that outcompetes weedy and sometimes even conservative species. They can invade and degrade even high-quality natural communities.

Prairie: A fire-maintained natural community dominated by grasses and with few or no trees (3)

Remnant: A site with all or part of its pre-settlement nature intact. (3)

Restoration: Repair or re-establishment of a natural community by reinstating as many as possible of the species and processes that evolved together in response to the physical environment and to one another over thousands of years or more. (3)

Stormwater Runoff: Precipitation that flows overland to surface streams, rivers and lakes.(2)

Wetland: Lands where water saturation is the dominant factor determining the nature of soil development and the types of plant and animal communities. (2)

Woodland: A fire-maintained natural community with a grassy turf dominated by trees. Some woodlands have many shrub species; others may have few.

1 *Vegetation of Wisconsin; An Ordination of Plant Communities*
John T. Curtis, 1959

2 *Project WET Curriculum and Activity Guide*, 1995

3 *The Tallgrass Restoration Handbook for Prairies, Savannas, and Woodlands*
Society for Ecological Restoration, Ed. Stephen Packard and Cornelia F. Mutel, 1997